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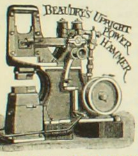

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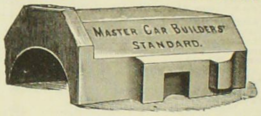

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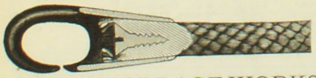

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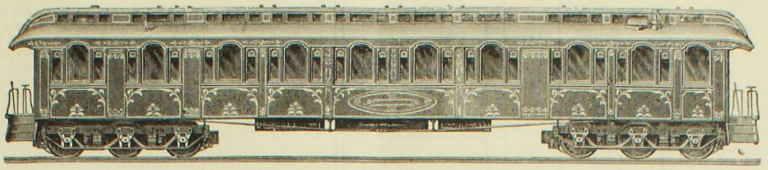


VOLUME XVII. NUMBER 12. | DECEMBER, 1886. | SINGLE NUMBERS, TEN CENTS, $1.00 PER ANNUM.

Miscellaneous Items.

A CURIOUS form of brick arch has been introduced in the locomotive fire-boxes of the State Railways of France. The arch is supported on water tubes, and is so constructed that the bricks form a V-like figure, the sharp point protruding toward the fire. The object of this is to deflect the flame so that it will strike the sides of the fire-box and thereby impart more of its heat to the water.

Two freight trains had a most disastrous butting collision on a western railroad lately, and a large number of cattle were killed. The trainmen saved their lives by jumping, but one of the engineers nearly lost his life afterward by being attacked by a maddened steer that escaped from the train. The animal pinned the engineer to the ground between its horns, but they were so wide and long that the man was not seriously hurt.

THE Illinois Central Railroad Company have adopted 36 inches as the diameter of all wheels to be used under their cars and tenders. Mr. Schlacks, superintendent of motive power, has recently made some changes on the dimensions of the 36-inch wheel formerly used, and drawings have been prepared of what will be the standard cast-iron wheel section. The thread of the new wheel will be the same as the M. C. B. standard recently adopted.

MR. CHARLES W. IRISH, of Iowa City, Ia., lately appointed by President Cleveland Surveyor-General of Nevada, is a railroad engineer of extended experience and a self-made man. He was engaged in surveying a great many pioneer western roads, his latest railroad work having been done on the Dakota extensions of the Chicago & Northwestern. Mr. Irish is President of the Engineers' Club of Iowa, and holds a high reputation in the profession.

GENERAL MANAGER T. F. Oakes, of the Northern Pacific road, announces in a circular that owing to the great length of the line it has been found necessary to establish the rule that all special cars hauled in the passenger trains of the road shall be equipped with steel-tired wheels and the Westinghouse train signal, all the cars of the road being equipped with both. Railroad companies making requests for transportation will indicate if this rule is conformed to.

THE second section of one of the regular trains of the Chicago & Alton road recently run from Bloomington to Chicago, a distance of 126 miles, in 193 minutes, stopping four times during the run. Considering that it takes about 45 minutes to make the 12 miles nearest Chicago, this train must have got over some portions of the road at high speed. During a recent inspection tour made by the directors of this road, the special train they were in ran 16 miles in 14 minutes.

THE Rood & Brown Car Wheel Works, at East Buffalo, N. Y., are nearly completed. The present capacity of the works is 150 wheels per day. It is the intention of the proprietors to make a thoroughly good and reliable wheel from the best material. The works have been constructed by Mr. Henry Smith, of Buffalo, under the superintendence of Mr. Henry M. Brown, formerly manager of the Scoville Wheel Works, and more recently superintendent of the Buffalo Car Wheel Works.

THE Scranton (Pa.) Board of Trade appears to be composed of men who devote well-sustained efforts to let the world at large know the advantages possessed by Scranton as a manufacturing location. They publish an annual report which always makes an attractive showing for the interests of the city. Around Scranton there are immense hills of anthracite coal refuse, and the city representatives are anxious to convince people that this culm can be converted into valuable forms of fuel. This year's report takes up the subject of natural and artificial gas, and predicts that the supply of the former will be short-lived, and then goes on to prove by figures which cannot lie, that by means of anthracite dust artificial gas can be made which shall cost only two cents per thousand feet. At this rate, the hills of anthracite culm ought to be gold mines for the city of Scranton.

WE have lately examined a new design of twist drill grinding machine made by the Standard Tool Works, Cleveland, O., which we think is likely soon to become a favorite in railroad and other shops where accurate work is done. The machine holds in the chuck, drills from $\frac{1}{4}$ to $1\frac{3}{32}$ inches in diameter, and grinds both sides without removing the drill from the chuck. The work is done automatically, the machine holding the work so that it is turned out true. The machine is neatly mounted on a single pillar, has few parts, and appears to be well made.

THE Wilkes-Barre *Evening Leader* says that one of the most prosperous enterprises in the Wyoming Valley is the new car wheel foundry erected by Mr. J. K. Sax, at Exeter, Luzerne Co., Pa. The foundry has a capacity for turning out 100 patent interlocking steel-tired wheels per day, of which Mr. Sax is the inventor. Some 2,000 of these wheels are in use on the Lehigh Valley road. The first locomotive equipped with them has run two years and made 49,322 miles, with a wear of only $\frac{1}{16}$ of an inch. Mr. Sax will also erect a rolling mill adjoining his foundry, for the manufacture of steel tires.

AN improvement in the driving of grindstones and emery wheels is that by which the wheel is given a reciprocating lateral motion in addition to its rotation. Every one has noticed the advantage of moving a tool from side to side on a grindstone so as to equalize the attrition on the different parts of the edge. It has now been found that by making the grindstone move laterally, and keeping the tool still, a more perfect result is attained, while the detached particles of steel have an opportunity to drop off the grindstone instead of being crushed into it, and the wear of the stone and the heating of the tool are both greatly diminished.

WE have enjoyed the pleasure of a pleasant visit from Mr. G. D. Peters, the well-known railway supply dealer of Moorfields, London, who was English Commissioner at the Exposition of Railway Appliances in 1883, where he made numerous friends. Mr. Peters is traveling on a wide-reaching tour which will take in all the leading railway centers of the United States, Canada, Mexico and several South American States. He reports business to be improving in Britain. Mr. Peters is so well acquainted with all leading railway men and those prominent in the European engineering world that a chat with him is very interesting to persons who like to keep posted about men and machinery of the old world.

THE St. Charles (Mo.) Car Co. have turned out the first passenger coach ever built west of the Mississippi. The new car is one of four ordered by the Atchison, Topeka & Santa Fe road. The outside is canary color, the interior finish solid mahogany of a light shade. The center pilasters continue through, in contrast with the usual abbreviation. The seats, which are of red plush, are equipped with the Hale & Kilburn spring. The deck lights are amber-colored, and together with the magnificent interior finish, give a very fine effect. The seats near the stove are protected from the heat by a thick wooden wall. The car, which will seat 60 passengers, was built under the personal supervision of general manager T. C. Salveter.

THE remarks which Angus Sinclair made at the last Master Mechanics' Convention, about the need of a better form of reverse lever for locomotives, led to no discussion in the meeting, but they have stimulated invention in that direction. Several improved quadrants and levers have been designed to meet the "long felt want," and some of the inventions possess great merit and would be certain to induce material saving in steam if adopted generally and used properly. Among the improvements is the May reverse lever latch, invented by Mr. Charles May, a road foreman of engines on the Pennsylvania Railroad. This is a double latch that enables the engineer to advance or draw back the lever half a notch at a time. The right to make and sell this latch has been purchased by Whittlesey & Wright, Washington, D. C. In a circular issued about the latch, they publish in full Mr. Sinclair's remarks on the subject of reverse levers.

THE Martin Anti-Fire Car Heater is a device for warming passenger trains without the presence of fire in the cars. The heat is obtained by using live steam from the locomotive by putting a dry pipe in the dome with a cut-off valve in the cab, to which is attached a reducing valve with a small pipe passing beneath the foot-board, to which is secured a metallic joint which conforms to the motion of the engine. The steam is then conducted under the tender and throughout the train by a main pipe with couplings. It is said that this method has been tried with favorable results on the Dunkirk, Allegheny & Pittsburgh; the Boston & Albany; and Bee Line roads. The device is owned by the Martin Anti-Fire Car Heater Co., of Dunkirk, N. Y.

THE North Chicago Railway Company, which operates all the street railways north of the river, have got permission from the city authorities to execute the work necessary to provide the means of operating their roads by cable instead of by horses. The city council practically gave away the La Salle street tunnel under the river to the railway company, and all cars going to and from the main part of the city will be run through the tunnel. Work is now in progress on the cable tunnel. All the streets where the cable will be laid down are busy thoroughfares and the people have to endure great inconvenience from having them torn up, but the "grip cars" are popular, and the citizens of North Chicago are willing to sacrifice a good deal to get better conveyances than the slow, cold horse car. When this extension of the cable system is completed there will be about 40 miles of double track operated by cable in Chicago. But even then they will have no rapid transit in the city. Cable cars are a little better than those drawn by horses, but the speed seldom averages six miles an hour when the delays are deducted.

AT the last meeting of the British Association, an apparatus was exhibited for determining the hardness of metals. The method followed was to make a cylinder out of the metal to be tested, polish its surface carefully, and move over it a sliding weight on a balance beam until a little diamond at the end of the beam made a scratch. The hardness of the metal was determined by the pressure required to make the scratch. The apparatus appears to have been too delicate for the ordinary run of engineering work, but it performed an operation that is very important. An urgent need of the day is a simple and sure way of determining the hardness of metal used in the arts. There is scarcely a line of hardware manufacture where an apparatus that would indicate the hardness of metal would not be of very important service. In railroad shops where steel tires are used, the means of determining the hardness of each tire would effect material saving, and most roads could afford to pay a high price for an apparatus to do the work. It is every day becoming more apparent that a large proportion of the cutting of flanges, which shortens the life of thousands of steel tires, is due to difference in the hardness of tires running on the same axle.

Paris Railway Exposition.

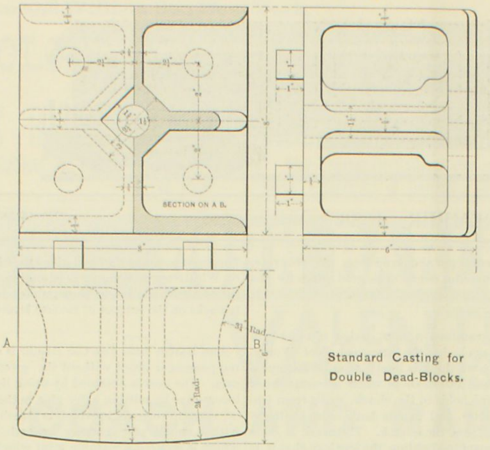
Beginning in May of next year, there will be an International Exposition held in Paris, and Mr. John W. Weston, editor of the *American Engineer*, of Chicago, has been appointed Commissioner General for the United States.

This exposition will comprise the various industrial and professional branches connected with railways, such as: Engineering and Mechanics, Locomotives, Machinery, Passenger Coaches and Freight Cars, Hoisting and Wrecking Apparatus, Apparatus for Heating and Lighting, Apparatus for Intercommunication, Couplers and other Railway Appliances, Building, Furnishing and Conveyance Material, Metallurgical and Electrical Apparatus, etc., etc., etc.

At the same time an International Railway Congress will be held by delegates from Railway Companies, Chambers of Commerce, Scientific and Professional Societies for the discussion of important questions of Management, Exploitation, Maintenance, Rolling Stock Security, Traffic, etc., etc.

Manufacturers and all others interested in the United States are earnestly invited to co-operate in order to secure such an exhibit as will enhance their prospects of foreign trade, and at the same time display the unexampled progress of their country.

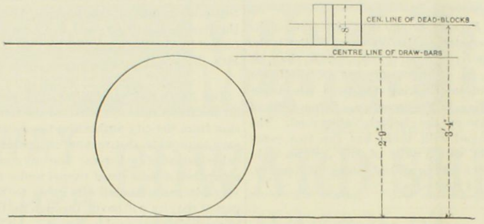
Fig. 1. Fig. 2.



Standard Casting for Double Dead-Blocks.

Fig. 3.

Fig. 4.



Standard Dimensions for Double Dead-Blocks.

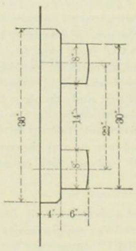


Fig. 5.

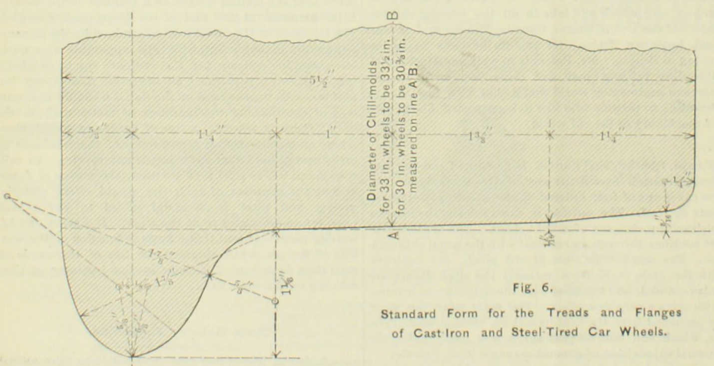


Fig. 6.

Standard Form for the Treads and Flanges of Cast-Iron and Steel-Tired Car Wheels.

NEW STANDARDS OF THE MASTER CAR BUILDERS' ASSOCIATION.

THE Chicago & Atlantic Railway is doing such a heavy freight business that a series of tests which Mr. Johann, master mechanic, intended carrying out for the purpose of demonstrating the value of various appliances on the locomotives, have been postponed till the spring. During the month of September the road moved 98,942 freight cars, being 4,200 more than were ever moved in one month before. All the freight engines ran an average 3,800 miles, and they could have done considerably more mileage had it not been for delays caused by want of sufficiently long passing tracks.

MR. EDWARD GALLUP, late general superintendent of the Boston & Albany road, has accepted the appointment as general manager of the Lake Shore & Michigan Southern Railway. Mr. Gallup is reputed to be one of the most capable and successful railway men in the country. He entered the railway service in 1869 as passenger agent of a Western road. After serving in that capacity on a number of roads, including the Boston & Albany, he was made assistant general superintendent of the last-named road in 1882, and two years afterward was promoted to the position of general superintendent.

New Standards Adopted by the Master Car-Builders' Association.

The Secretary of the Association announces, under date of Oct. 15, the adoption by letter-ballot of four additional standards, but the announcement was not received by us in time for insertion in our November issue. These new standards, the illustrations of which we give herewith, are as follows:

1. Dimensions and form of castings for double dead-blocks, as shown in Figs. 1, 2 and 3, and *adopted* by a vote of 381 to 119, being over two-thirds.

2. Dimensions of beams for double dead-blocks, shown in Figs. 4 and 5, and *adopted* by a vote of 375 to 126, being over two-thirds.

3. Form of tread and flange of cast-iron and steel-tired car wheels, shown in Fig. 6, and *adopted* by a vote of 411 to 91.

4. The Christie brake shoe was also *adopted* as a standard by a vote of 369 affirmative against 130 negative.

The proposed height of 34½ inches as the standard height of draw-bars of passenger cars from top of rail to center of hook, in place of the present standard of 33 inches, was also submitted to letter-ballot and *rejected* by a vote of 246 in the affirmative to 276 negative.

The following action of the Executive Committee at a meeting held in New York, Sept. 16, 1886, is also announced:

Automatic Couplers: It was resolved "That hereafter the Executive Committee will not examine into the merits of any car coupler unless it has been put into practical use, and the inventor of it, or the owners of the patents, sign a written statement that they believe it to be as near perfect as they know how to make it, and then get five members of the Association to certify that they believe the coupler is a practical one, with a recommendation that the Executive Committee investigate its merits."

Wheel Defect Gauge: A resolution was adopted, recommending "that, at the next convention of the Association, the radius of the curve for the throat of the flange of the wheel-defect gauge should be made $\frac{3}{16}$ in., instead of ⅝ in., and the committee also recommended that the railroad companies make this change now."

Brake Trial Fund: The Secretary reported that he had received $25 from each of the 14 following companies to defray the expenses of the brake trials made at Burlington, Iowa: Pennsylvania; Boston & Albany; Atchison, Topeka & Santa Fe; Chicago, Milwaukee & St. Paul; Northern Pacific; Louisville & Nashville; Chicago & Northwestern; Cleveland, Col., Cin. & Ind.; Illinois Central; New York, Lake Erie & Western; Pittsburgh; Cincinnati & St. Louis; Grand Trunk; Baltimore & Ohio; Union Pacific; a total of $350.

A resolution was adopted instructing the sub-committee, which was appointed at Niagara Falls, to raise funds to defray the expense of the brake trials, and to solicit railroad companies to contribute the money required, which is $500, to publish the Brake Committee's report.

Rules of Interchange: The Secretary was instructed to send a circular to the members of the Association, requesting them to suggest to the Executive Committee any amendments or changes to the rules of interchange which the members may think are required.

An Elevated Railroad for Chicago.

It seems settled that Chicago will have an elevated railroad in the near future. Colonel G. H. Ellers, a well known civil engineer, represents a syndicate of capitalists in the East who are furnishing money to build a first-class elevated railroad through various portions of the city. A great portion of the right of way had been quietly secured before the public generally were aware that any bona fide railroad enterprise of this kind was contemplated. It is the intention to build a first-class structure of wrought iron and steel, that will carry any train. No expense will be spared to make the road safe for any load that is likely to be placed upon it, nor will there be anything held back that will help to make the machinery for operating as efficient as possible. The cars will be of the ordinary suburban type, with all provisions for making the passengers comfortable. The locomotives will weigh about 30 tons, and the intention is to have them powerful enough to have a train running twenty miles an hour before the last car passes the end of the platform. Colonel Ellers has considerable railroad mechanical engineering experience and is designing and working out the details of the locomotives himself.

We understand the road will be built from a point in the heart of the business portion of the city southward beyond Hyde Park. The corporation of the latter town have granted valuable right of way privileges to the company. Branches will be built from the main stem of the road, extending into several of the best residence districts to the right and left. Every detail of the enterprise appears to have been thoroughly considered, and there is every appearance that Chicago is about to obtain a greatly needed means of rapid transit, and that the capitalists sustaining the venture will reap ample returns for the money invested. When the enterprise was first made public there was opposition raised by some of the property owners along the proposed route, but most of that has now ceased.

THE Union Pacific Railway people have been getting more freight for some months back than their power was capable of handling, and they have been using ten locomotives borrowed from the Wabash. The latter engines are cordially disliked by the U. P. trainmen, for they have no air pumps and the air brake cars cannot be utilized to hold the trains, so the men have to resort to the hand brakes, a method of holding freight trains that seems deplorably antiquated to the average U. P. brakeman.

Testing the Value of Different Proportions of Locomotives.

BY ANGUS SINCLAIR.

The mechanical department of the Chicago, Burlington & Quincy Railroad have been investigating questions connected with the working of their locomotives, and the discoveries made will be highly interesting to all those who interest themselves in the economical movement of railroad trains. Like nearly all other well managed railroads having steep grades, the C., B. & Q. people follow the policy of giving freight engines all the cars they can pull, and there has been considerable diversity of opinion about what constitutes a full load for certain kinds of locomotives. The enginemen and trainmen wish to be permitted to go along with loads that have a free margin under an engine's full capacity; and the officers interested in moving freight at the least possible cost try to have engines pull every car that can be taken over the steepest grades. Making a locomotive pull every car it can move over a hill is not an economical way of using steam, but it is undoubtedly the most economical way of moving freight cars, for on hilly roads one car less on a hill means a loss of 7 or 8 per cent. in power.

There are several classes and various sizes of locomotives doing freight work on the road, and there existed among the mechanical officers difference of opinion as to the effect certain boiler, cylinder, valve, and wheel dimensions have upon the work-performing efficiency of locomotives. Some of the engines have cylinders 17 inches diameter, while others with practically the same boiler and adhesion, have cylinders 18 inches diameter. A belief prevailed on the road that the engines with the small cylinders would pull as many cars over a heavy grade as the engines with the large cylinders. Large and small driving wheels are in use on the same divisions, and there is a conflict of opinion as to the value and utility of the different dimensions. Some of the engines have eccentrics with 5½ inches throw, which is also the travel of the valves, and other engines of similar size have but 5 inches of eccentric throw and valve travel. An impression prevailed that the engine with the larger travel of valve was under ordinary conditions smarter and more efficient than the one with the shorter travel. Inside lap was employed on some engines, as much as ⅛ inch being used, and other locomotives doing similar work had the valves line in line inside, or a trifling lap that amounted to the same thing. This also gave rise to diverse views, some contending that inside lap was a source of steam-saving and beneficial to the smooth working of the engine, while others equally able to judge regarded inside lap as a detriment in every respect.

Without having any features to render them specially different from other engines on the same divisions, some of the locomotives had the reputation of being smart, powerful or economical, while others of the same dimensions had a diametrically opposite reputation. In all these respects the C. B. & Q. locomotives very much resemble the engines doing the work on nineteen-twentieths of American railroads. Where thinking and reasoning men are in charge, there will continue to be contending opinions about the effect of mechanical combinations. The effect of many features about locomotives are so unsettled that the road is fortunate where reason and not prejudice regulates the discussion of their merits. Here trainmen discussed the worth or the short-comings of the various locomotives as they do elsewhere, and the reputation of engines was established by the way trains were handled.

This year the officers of the C., B. & Q. determined to substitute measurement in place of surmise and prejudice. They decided to take away from the region of good guessing the decision as to how many cars certain locomotives could pull, and settle it by a precise record of the work the engine was capable of performing. A lengthened series of experiments were conducted by the engineer of tests and trained assistants, and the power developed by the leading types of locomotives under the most varied conditions of service was accurately recorded by apparatus specially designed to insure precision. The fine dynamometer car belonging to the road was used to obtain exact records of traction and speed, indicator diagrams were taken from the cylinders of the locomotives, and careful coal and water consumption tests were made. Electrical connection was maintained between the locomotives and the dynamometer car, and the instant an indicated diagram was taken it was recorded on the moving traction and speed sheet. Those who have done much indicating of locomotives and understand the difficulty of obtaining the exact speed at the instant a diagram is taken will appreciate the value of this arrangement. The arrangements for recording the work done by the locomotives were as nearly perfect as possible, and the men making the tests were skilled in the business by protracted training—a most important matter where accuracy is essential. There is good reason for believing that the experiments in testing the power of locomotives and the resistance of trains, conducted on the C., B. & Q. road this year, have supplied the most accurate information ever obtained on the subjects investigated.

Through the kindness of the management of the road, as representative of the CAR AND LOCOMOTIVE BUILDER, I was granted permission to accompany the dynamometer car. The privilege was freely embraced, and numerous interesting experiments were witnessed. The latest tests were made on a steep grade near Red Oak, Ia., and were undertaken for the purpose of showing the relative hauling capacity of 17 inch and 18 inch cylinder locomotives. The grade is so long and steep that 13 loaded cars are rated as a full train for eight-wheel engines with cylinders 17 or 18 × 24 inches, and driving wheels 65 inches diameter outside of tires. Two engines tried were of the standard type. One had one inch more diameter of cylinders than the other, but in all other dimensions the engines were identical. They weigh 83,000 pounds in working order, have fire-boxes 72 inches long, with 17.6 square feet of grate area. 115 square feet of fire-box heating surface, 189 tubes 2 inches diameter and 11 feet 6⅛ inches long, the whole giving a total heating surface of 1,075 square feet. Double nozzles are used on the engines, the smaller cylinders passing the steam through 3-inch nozzles, and the larger cylinders through nozzles 3⅛ inches diameter.

In the first test, the 17 inch engine was coupled on to a train consisting of fourteen loads, the dynamometer car and way car. This was one more car than the rated load, but the engine took the train over the summit. The rails were clean and dry, and no sand was used except a little in the start. The maximum steam pressure carried was 145 pounds to the square inch, and the engine kept close to the blowing-off point during the whole pull.

After getting to the top of the grade, the train was backed down to the station and another car taken on. With the 15 loads the engine got away with the train in good shape, but stalled on the heaviest portion of the grade. The point reached was marked with a stake, and the train backed to the station. The 18 inch cylinder engine then took hold, the same engineer handling both of the engines.

By this time great interest was manifested in the tests by numerous railroad men assembled at the station. Most of the spectators were ready to bet money that the 17-inch engine, which was the favorite, would beat the other. There was some delay in making the next trial owing to trains passing, and quite an excitement arose about the result. The locomotive engineers and trainmen all favored the performance of the smaller engine. The engine with the 17 inch cylinders would be equal or ahead of the other when the rails were very slippery, but ordinary calculations pointed to the 18-inch cylinder doing more work than the other one on a dry rail, for she had 10 per cent. more piston area and one car added to a train of 14 cars would increase the load only about 7 per cent.

The 18-inch engine started with the 15 loaded cars, the dynamometer car and the way car, the same train that had stalled the other engine, and she took them over the hill with about the same apparent effort as had been developed by the other engine in taking up 14 cars, but the dynamometer recorded a proportionately heavier pull. The train was again backed to the station, and another loaded car taken on, but this time the engine stalled, going up about ninety feet further than the 17-inch engine had gone with 15 loaded cars. The dynamometer record indicated that the 18-inch engine was superior in power to the other one just about the proportion due theoretically by reason of the greater piston area. The indicator diagrams pointed to a similar conclusion.

The trainmen were intensely surprised at the result.

The teaching of all the investigation of locomotive efficiency made by this company points to the conclusion that engines of the same class will do precisely the same work if handled in the same way. The apparent difference in power is nearly always due to the handling. Some engineers constantly coddle the engine they run and imagine that hard work injures the machine. Where a train can be "run" over a grade, the success of pulling cars over it depends in a great measure on how the grade is approached and how the engine is kept to its work on the hill. On a long stiff grade a locomotive will take up only the cars she can pull on a steady haul, but on a short steep grade the speed at the beginning will mean everything in getting over. When the engine strikes the foot of the grade the speed may be thirty-five miles an hour, and with the best that skillful handling can do the speed at the summit it may be down to about three miles an hour. The engine in this case has every rod been drawing on the inertia of the train to help it over. That is, the train was taken over the grade by the power of the engine, plus the inertia of the train at the bottom of the hill. If the engineer, however, fails to drop the reverse lever forward fast enough to increase the tractive force of the engine, speed will decrease so rapidly that a stop may be reached before the summit. The man who is intensely anxious to save his engine, never drops the links a notch till loss of speed indicates that he is likely to stall, and if the hill is steep and the train heavy, the indications nearly always prove correct. Of course the advancing of the reverse lever must be done with judgment or there may be loss of power in trying to gain an advantage, but many engineers are disposed to be too late in advancing on the notches. Advancing the lever prematurely may tear up the fire, and such a large volume of steam may be passed through the cylinders at high piston speed, that the engine will fail to get the steam out fast enough and obstructive back pressure may ensue, but no injury to the engine will result.

Another fertile cause of apparent difference in the power of locomotives, is in the way the reverse quadrants are notched. Most locomotives have the different notches marked for the point where the valve is supposed to cut off steam when the lever is in the notch, but very few of them are correct. One engine cuts off at 6 inches in the six-inch notch, the next one we come across cuts off at 7½ inches when in that notch, and another engine cuts off at 5 inches when the lever is in the notch marked 6 inches. Similar irregularities, often of greater magnitude, run throughout the whole of the notches of the quadrant. The writer has done a great deal of work indicating locomotives, and his habit has been to find out the exact points of cut off, but he never once found them to coincide exactly with the quadrant notches, and the real point of cut-off was often found three inches away from the point where the stamped mark indicated it to be. The result of this state of affairs is that engineers talk about certain engines being smart or logy in comparison to others at 6, 9, and 12 inches, and so on as the case may be, when, it would be found, if closely examined, that the engines were not working under nearly the same conditions.

A series of tests were made to ascertain what, if any, difference increasing the throw of eccentric had on the working of a locomotive. The trials were made with various engines on different kinds of service, but in each case the same engine was tested with long and short throws. That is, they tried an engine with a 5-inch throw on certain work, then they put on a 5½-inch throw eccentric, at the same time changing the link saddle so that the cut-off could be adjusted, and then tried the altered engine on the work done when the other eccentrics were operating the valves. They could not find that the increase of eccentric throw and valve travel effected any difference in the working of the engine. The engines handled high-speed trains equally well with either valve travel, and the indicator diagrams taken with the same speed and cut-off were of precisely the same size and shape.

A comparative test of engine No. 430, with 5 inches and 5½ inches eccentric throw, was made on Prescott hill. The grade was divided into stations 440 feet long, and the engine started from the foot of the grade.

Train 901.15 tons. Eccentrics 5 inches throw.		Train 905 tons Eccentrics 5¼ inches throw.	
Station.	Speed. Miles an hour.	Station.	Speed. Miles an hour.
1	3½	1	5
2	10	2	11
3	14½	3	14¾
4	17¼	4	17¾
5	19	5	20
6	21	6	21
7	22	7	21
8	21½	8	22
9	21	9	21
10	19½	10	20¾
11	19¾	11	21
12	20¾	12	22
13	21¾	13	21½
14	20	14	21
15	17½	15	17½
16	15½	16	15½
17	13½	17	13¾
18	10½	18	10
19	7	19	7½
	Stalled.		Stalled.

When using the 5½ throw eccentrics, the engine took the train 57 feet farther before stalling than when the 5-inch throw eccentrics were used, but the dynamometer car record and the indicator diagrams showed that the engine worked equally as well either way. As the same trains were not used, there might have been many circumstances to account for the slight difference in distance attained.

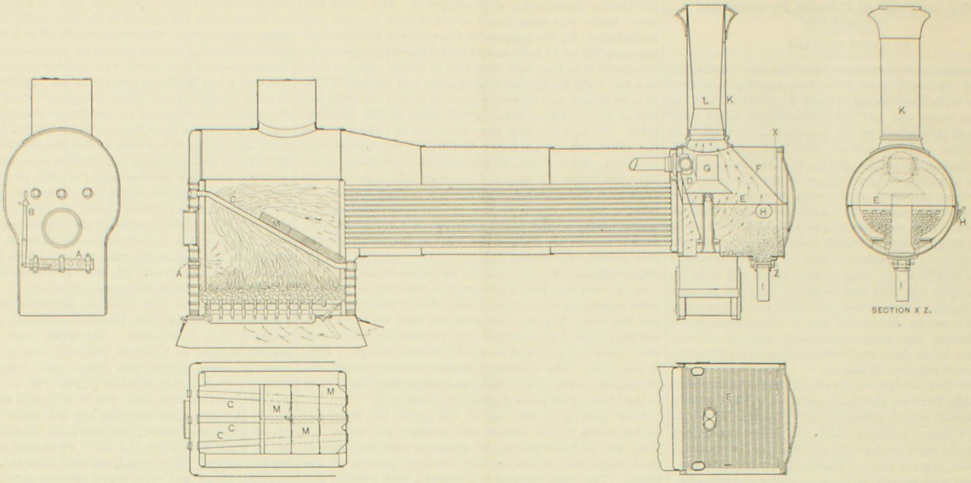
The records indicate that inside lap injuriously affects the working of the locomotive under all circumstances.

Liquid and Gas Fuel for Locomotives.

Every few months the newspaper world discovers and makes much wondering talk of the fact that some railroad in Russia, in Asia, or in some other distant clime has succeeded in using oil or gas as fuel in locomotives, and the cry is repeated, Why do American railroads not follow this example? Several locomotives belonging to American railroads have been equipped with the appliances necessary for burning liquid fuel, and it was plainly and repeatedly demonstrated that the required head of steam could be maintained with engines burning such fuel. That American locomotives are not burning petroleum products is not because our inventions have not provided the means for doing so, but because it is cheaper to burn coal. What may be economical practice in Russia or in Egypt, where good coal is dear, is likely to be very expensive practice in countries like the United States, where coal is plentiful and cheap.

Of late, the attention of railroad mechanical men has been directed to the problem of devising the means for burning natural gas in locomotives, and the progress towards making fuel of that character a success is very promising. But the use of gas must necessarily be confined to the limited area over which natural gas is found in large quantities. Gas of this kind is so attenuated that the proposals to transport it under great pressure to distant parts for use are not likely to lead to much action, for it is almost impossible to construct vessels that will retain the gas under heavy tension.

THE State of Iowa has been in the habit of assessing taxes on the Pullman sleeping cars doing business in the State. This year the sleeping car company have refused to pay the taxes and are fighting them in the courts.



BARNES' SMOKE-CONSUMER AND SPARK-ARRESTER.

The engravings show the inside arrangement of locomotive boilers equipped with the Barnes smoke-consumer and spark-arrester, and in service on the Wabash, St. Louis & Pacific system of roads.

A is the damper for admitting air to the fire-box, and is placed in such a position as to be easily operated by the fireman. The quantity of air to be admitted over the fire is regulated by the lever *B*.

C shows the water tubes, which are three inches outside diameter and lap-welded. Six $3\frac{1}{16}$-inch holes are drilled through both sheets of the fire-box, the tubes bent to the proper form, put in and rolled in the same way as the 2-inch boiler tubes. The outside holes of fire box are tapped and a brass plug screwed in. Seven $2\frac{1}{16}$-inch holes are drilled through both sheets of fire-box under fire-door. and seven 2-inch outside diameter tubes put in for air passages. These tubes are covered by damper *A*.

M shows the brick arch. The bricks are 17 × 16 × 4 inches, and lie on the water tubes. Six bricks are generally used to each furnace. *D* is a solid deflector plate made of common iron and placed in front of flues. It extends $4\frac{1}{2}$ inches below center line of boiler. *E* is a perforated plate, which extends from deflector *D* to front end. *F* is a deflector plate in front of smoke arch. It cuts off the top and useless part of smoke arch, thus reducing the area to be acted upon by exhaust, and also causes a direct current to base of stack. *G* is a petticoat pipe ; *H*, hand-hole plate ; *I*, clearing hole ; *K*, outside barrel of stack ; and *L*, ejector in stack, which is 13 inches in diameter at its smallest point. The exhaust nozzles are double, and extend but a little above the center line of boiler. The tips are bored out $3\frac{1}{2}$ inches for 17-inch cylinders.

The first engine to which the arrangement was applied was remodeled, and the extension put on in the Springfield shops of the road nearly a year ago, and has since then been running in heavy passenger service, receiving no repairs except renewal of brick arch. The extension front boilers as a class show but little saving in fuel over the diamond stack, their only apparent advantage being that they throw out less smoke and cinders ; but the Barnes device shows a great saving in fuel, and is also as clean, if not cleaner, than any other class of extension fronts.

Engine 1,200, equipped with extension, has made a remarkable record.

This engine, on a passenger run between Springfield and Quincy, a distance of 113 miles each way, and with a train of from four to seven cars, or an average of five cars for each trip. The engine was built by the company at their Springfield shops. Cylinders, 17 × 24, drivers, 63 inches in diameter, and a total weight of 81,000 pounds.

In July this engine made 3,232 miles on 40 tons of coal, an average of 80.8 miles to a ton ; in August, 3,684 miles on 52 tons of coal, an average of 70.7 miles to a ton ; in September, 3,164 miles on 43 tons of coal, an average of 73.6 miles to a ton. About 75 of these engines, equipped with extensions, are running on all parts of the Wabash system, and giving equal satisfaction.

The Painting of Passenger Cars.

At the recent convention of the Master Car Painter's Association, in Chicago, a paper was presented by Mr. Wm. Davis, of the Canada Southern road, on the "Cracking of Paint and Varnish," in which he states that in accordance with instructions given at the last previous convention, he had painted some twenty panels in three different body colors, olive brown, Tuscan red and yellow. One-half of these panels were also varnished, the paint on the other half being exposed. In varnishing he used different formulas, rubbing the first coat in some and finishing with two finishing varnishes. In others he used medium with two coats of finishing, and still others with three coats of finishing varnish. The paper continues :

I find that upon examination of the panels before me that those done with the least oil are so far showing the best surfaces. The varnish on these panels stands out more solid and brilliant without as yet the sign of a crack, as does also the painted part, while those done with the most oil seem to have flattened the varnish surface. I have also three or four boards that I painted and varnished over three years ago. The boards were painted after or rather with the same formula, Japan colors, as I painted my coaches. They have been exposed in all kinds of weather for over three years, and yet there is not the least sign of a crack. Of course the varnish has perished to a certain extent, but the paint is still as solid to all appearances as when first put on, and yet some of the coaches done with the same formula have cracked, more particularly at right angles with the panels, while other coaches have not the appearance of a crack. I also notice that the large iron panels in center of cars, as well as iron battens and corner plates, are without any cracks, but stand just as solid as when fiast painted, while the woodwork on the cars is cracked. True, in some cases the paint on the iron may flake off, but that is invariably owing to the presence of rust under the paint. Now perhaps you ask how do I account for this. Well, I invariably notice that these cracks start or commence at the battens or joints and nail holes, and run nearly across the panel. I account for this in two ways. In the first place we are apt to allow too much of an accumulation of paint and rough stuff along the edges of the battens and in the depressions caused by the nails by not sand-papering and rubbing down close enough, this more particularly near the battens or joints of sheeting. Now, after the car has been exposed for a while the battens warp, shrink and draw away from the panel, thus breaking away from the paint and leaving an opening for the admission of moisture in any form to enter either under the battens or through the broken painted surface, thus undermining the whole structure of paint. You will also observe that the panels being well and firmly screwed or nailed to the studding under the battens, those same screws and nails causing dampness and rust, all has a tendency to destroy the life of the paint. Now, under these circumstances, the panels held firmly to the studs or frame of car cannot readily give with the strain or sudden jar of the car, which, I think, would cause the paint and varnish to give way first at those places, when in the course of time it extends across the panel or sheeting, as the case may be.

I have noticed—what I consider a remedy to some extent—that those coaches that were well primed under the battens and edges and backs of panels as well as the face of frame and sills were well painted and the battens put on with stiff white lead on the under side and well nailed, very seldom showed any cracks. This applies as well to sheeting. In the second place, if you observe your cars closely, you will see that the perishing or cracking takes place first on the battens where it comes in contact with the window sill, as also under the window sill near the battens. You will see at a glance that this is caused by moisture or water that runs between the window stop and sash and then runs down behind the battens and back of panels or through the top edge of panel, which is generally void of paint or anything to protect it from dampness. You can easily suggest a remedy here. As I said before, cracks caused by poor material may be remedied at the will of the purchasing agent.

I have tried the method of having our standard body colors ground stiff in oil as well as in Japan and I have always found the best results in favor of Japan colors. It seems to me unreasonable to put a slow hardening as well as a slow drying body of paint under a quick hardening body of varnish (rubbing or even finishing in some cases) and expect that there will be no cracking of either the varnish or paint unless days are allowed for each coat of paint to dry. On the other hand, if Japan colors are used after building up your foundation if it is necessary you can then use just what proportion of oil may be necessary in your Japan colors, but I should say be very sparing of your oil in your finishing colors and allow a reasonable time to dry, discarding the use of rubbing varnish on the outside of coaches or over painted surfaces and you will have reason to expect good results.

How Shippers Value Fast Stock Trains.

We were talking lately to a stock man who had brought to Chicago a herd of cattle from Omaha, and they were run through in a fast train equipped with air brakes. This gentleman has been in the business for years, and was very enthusiastic about the condition of the stock at the end of the long journey. None of the animals had been knocked down in the cars, as is invariably the case with ordinary stock trains, and the reduction in time of making the run led to smaller loss in weight than he had ever known before. This shipper wants all his stock in future carried on fast air-brake trains.

On mentioning this conversation to a sharp railway superintendent, he asked the practical question, How much additional rate was that shipper ready to pay for getting his stock pushed through on fast trains? That phase of the question had not occurred to us before, but it was certainly reasonable that a railroad company which had incurred the heavy expense of putting air brakes on their stock cars, and burned additional fuel to keep a train running at thirty-five miles an hour, should receive some equivalent from the parties receiving the direct benefits of a fast run. We therefore searched out the shipper again—his enthusiasm was a little cooled down by this time—and inquired, "By the way, how much in the way of extra rates would you be willing to pay for getting your stock run through in fast and brake trains?" "Extra rates be"—well, he did not give a polite reply.

An Engineer of Many Resources.

The following example of how ingenuity and perseverance will enable an engineer to overcome difficulties that appear almost insuperable was contributed to the *American Machinist* by a correspondent in Macon, Ga.:

I send you an account of an accident that happened on the Mobile & Girard Railroad, near this place, in which a brainy young engineer came out ahead of the "unexpected, which often happens." He was running an "extra;" while going at full speed between two stations, he attempted to open the throttle at the foot of a short grade, and the stem broke entirely off about ¾ of an inch inside the gland. Fortunately the valve closed. Being several miles from a meeting point, he was in a "fix," but he belongs to that class of progressive young runners who never allow themselves to remain "fixed" for any length of time. So uncoupling from his train, he used his tallow pipes to convey steam to the cylinders, thereby enabling him to run the engine to station, where he arrived on time. There he reported to headquarters, and while waiting for orders, took the engine of the regular to sidetrack his train. Receiving orders to "bring her in if possible," he proceeded to do so in the following manner: The throttle valve was of the old style V pattern, with the throttle-box in smoke-box. He found on "monkeying" a little, that by keeping cylinder cocks closed and opening tallow pipe plugs or valves, allowing steam to pass through the cylinders into the steam pipes, that it was very near balanced. He then screwed the gland up hard until the broken stem came within ⅛ inch of the end, and taking an old chisel, which he used as a calking tool, he calked or riveted the end until it was perfectly tight in the gland. By holding the stem in this way he was enabled to screw the gland in and out, working the gland sufficient to run the engine to the shops, a distance of 30 miles. By using reverse lever and the brakes, he had complete control of train.

After filling the cylinders and steam pipes by means of the tallow pipes, a throttle valve of the old V pattern will invariably fly open of itself.

American Street Railway Association.

At the annual convention in Cincinnati the following officers were chosen : President, Thomas W. Ackley, Philadelphia ; First Vice-President, Albert G. Clark, Cincianati ; Second Vice-President, William H. Sinclair, Galveston, Tex.; Third Vice-President, Prentice W. Cummings, Cambridge, Mass.; Secretary and Treasurer, W. J. Richardson, Brooklyn, N. Y.; Executive Committee : Julius Walsh, St. Louis ; Henry Hurt, Washington ; C. D. Wyman, New York ; Dr. A. Everett, Cleveland ; S. S, Spaulding, Buffalo, New York.

Western Railway Club.

At the regular meeting of the club, held Nov. 17, there were 33 members present and 14 visitors. President Scott occupied the chair.

The President introduced Messrs. J. W. Marden and J. N. Lauder, President and Vice-President of the New England Railroad Club, and extended to them a hearty welcome.

The Secretary read the Treasurer's report for last year, showing the finances of the club to be in a satisfactory condition.

LOCOMOTIVE WHEEL CENTERS AND SECTION OF LOCOMOTIVE TIRES

Was the first subject for discussion, and it was opened by the following statement, submitted by Mr. W. L. Gilmore, of the Lake Shore & Michigan Southern road :

THE WEAR OF TIRES.

Memorandum showing average miles run to 1-16″ wear in thickness between turnings, and average miles run per 1-16″ wear for four turnings, together with loss per cent. to 1-16″ wear each turning compared with total loss all turnings, and per cent. of mileage each turning of 1-16″ wear compared with total mileage of tire on 25 locomotives in service on Michigan Southern division Lake Shore & Michigan Southern Railway.

Miles run before turning	972,752
Miles run after first turning	946,826
Miles run after second turning	823,481
Miles run after third turning	925,657
Miles run to 1-16″ wear before turning	7,570
Miles run to 1-16″ wear after first turning	7,039
Miles run to 1-16″ wear after second turning	6 168
Miles run to 1-16″ wear after third turning	6,659
Average miles run to 1-16″ wear for four turnings	6,851
Per cent. of loss before turning to 1-16″ wear compared with total loss	24
Per cent. of mileage before turning to 1-16″ wear compared with total miles	26.5
Per cent. of loss after first turning to 1-16″ wear compared with total loss	25
Per cent. of mileage after first turning to 1-16″ wear compared with total miles	25 6
Per cent. of loss after second turning to 1-16″ wear compared with total loss	24.9
Per cent. of mileage after second turning to 1-16″ wear compared with total miles	22.4
Per cent. of loss after third turning to 1-16″ wear compared with total loss	26.1
Per cent. of mileage after third turning to 1-16″ wear compared with total miles	25 3

The statement shows four service mileages and four turnings for 25 engines on Michigan Southern division Lake Shore & Michigan Southern Railway, statement concluded after fourth turning.

These records were promiscuously taken from our books, and not selected as any exceptions from the general average. It will be seen by this statement that the largest mileage per 1-16 inch loss in thickness was made before first turning, and second largest mileage after first turning, while third largest mileage was made after third turning, and lowest mileage after second turning.

While the percentages show no very marked difference, they do show that the smallest mileage (with tire 3 in. thick when new) based on the first four turnings was obtained when tire had lost about 15-16 in. or 1 in. in thickness, when they began to show a greater mileage.

Assuming that tires should be worn to about 1 in. thick, it would seem we get the poorest mileage when about 50 per cent. worn out.

I understand that some of the members have had experience with tires thicker than 3 in.

between them and thin tires. Preferred the 4-inch tire because it gave long mileage.

Mr. Mackenzie thought the superior wear of the 4-inch tire was due to its making the wheel larger, which would prevent the pistons from having the same power to cause slipping. Wished to hear views of members on the best width of tires.

Mr. G. W. Rhodes (C., B. & Q.) did not see what advantage his road would reap by adopting a standard wheel center, the same as other roads, for their sizes were already settled. They had been using a number of 4-inch tires, and had prepared a statement to show their wear compared to the wear of 3-inch tires. He was very much surprised at the result, which shows in every instance that the 3-inch tire gives greater mileage per 1-16 wear than the 4-inch tire. Find 45 engines have worn out a 3-inch tire, making a total average of 131,267 miles, or on an average of 4,250 miles per 1-16 inch ; and 13 engines have worn out their 4-inch ties in an average of 133,958 miles, or 3,252 miles to 1-16 inch of wear. Mr. Rhodes submitted the statement below :

The President requested Mr. J. N. Lauder (Old Colony) to give his views on the question.

Mr. Lauder expressed himself as being emphatically in favor of standards of all kinds, and consequently in favor of standard wheel centers and standard tire section. He was aware that large roads could establish their own standards and manufacturers would carry the sizes in stock, but it was different with small roads, which comprise the great mileage of the country. The time had come when uniformity was necessary for roads of this kind. He mentioned the work done by the Master Mechanics' Association in adopting wheel centers, and directed attention to the necessity for using properly made gauges to measure wheel centers with, recommending the gauges made by Pratt & Whitney. In regard to the matter of standard tire sections and thickness and width, it is perhaps just as important in a commercial point of view as it is to have standard sizes of inside diameter. If we have no standard of thickness and no standard section of flange and tread, and no standard width, tire-makers will be as much at sea in regard to what the railroads want as they are at the present time, and they will not dare to manufacture tires ahead. Now, the very object of this movement of the Master Mechanics' Association was to enable tire manufacturers to manufacture tires and pile them up, keep them on hand, keep them bored on hand, preventing the necessity of railroads carrying the stock, because they could give their orders for them so quickly. If the manufacturers know what we want and what our standard is, they can safely manufacture thousands of sets and pile them up in their storehouses, all bored, ready to ship when an order comes for a set of tires. Uniformity of tires, both in section and thickness, can be brought about very much more quickly and with much less trouble and expense than the standard axle was brought about, and if every man takes hold and brings every old engine that he can bring without too much expense to these sizes, in a short time we will have a uniform thing right through. This paper presented by Mr. Rhodes seems to me to be a very valuable one. It is the first real data that I have seen bearing on the question whether a 4-inch tire is better or worse than a 3-inch tire. I have supposed from my knowledge of the construction of tires that a 4-inch tire would not give the same wearing qualities that a 3-inch would. I do not believe that the 3-inch would give the same wearing qualities that a 2-inch would. But, still, with a 3-inch tire you have an inch and a half of metal available for wearing purposes, and an inch and a half to throw away. If the thick tire wears as well as the thin one texture all the way through to a 3-inch tire." That is what we want.

The President called on Mr. E. N. Chapman for his views on the subject.

Mr. Chapman did not care to put himself on record about the relative value of 3 and 4-inch tires. They were making tires just as their customers wanted them. He thought the adoption of a standard tire section would be a benefit to railroad companies and tire makers both.

Mr. Mackenzie had ordered some 4-inch tires, and his reason for doing so was that he expected to get more mileage per $\frac{1}{16}$ inch wear. Was surprised at Mr. Rhodes' statement. Believed the figures, but thought the subject needed to be looked into further.

Mr. Lauder wanted to hear what objections there were against adopting for locomotive tires the standard shape of wheel tread adopted by the master car builders.

Mr. L. E. Johnson (C., B. & Q.) was in favor of giving the shape of tread and flange more attention than the thickness of tire. Thought it probable that tire makers would yet strengthen their machinery so that a 4-inch tire would be rolled as good and sound as a 3-inch tire when they find that there is a demand for the thicker tire. He favored railroad companies buying the material that would give the greatest wear. Thought the recommendations to adopt the master car builders' standard tread were in the right direction.

Mr. R. Quayle (C. & N. W.) asked if the 3 and 4-inch tires were placed on the same size of centers, and was answered in the affirmative. He then expressed the belief that the fault was in the tires, as they had been using 4-inch tires on the C. & N.W. of an English make, which give as good mileage per unit of wear as 3-inch tires. Favored the use of 4-inch tires because it saved the expense of frequently removing and replacing tires.

President Scott : There has not been a word said in this discussion as to whether any of these engines referred to used power brakes or not. It strikes me that an engine using driver brakes might give a different result from one that did not. We have different sorts of brake shoes ; some are going into flange shoes for the very purpose of keeping the tire tread what it ought to be, and necessarily wearing it a little faster.

Mr. Rhodes : Nearly all the engines included in that report have the driver brake used constantly. We are so much surprised at this report that I would not have presented it to the meeting if it had not been so uniform ; they all show the same difference of wear. The comparisons are all made between engines with the same sized centers in each case. We are not comparing a 17-inch cylinder with a 15-inch cylinder ; we are comparing a 15-inch cylinder and 3-inch tire with a 15-inch cylinder and 4-inch tire.

Mr. Lauder : We are using to some extent the Ross shoe on our driver brakes. I believe that it is a substantial improvement in brakes and brake shoes. It certainly has a tendency to keep the flange down and the portion of tire that does not get wear from legitimate causes and does not wear the tire where the legitimate wear upon the rail comes. So that in using the driver brake with the Ross shoe, I see no reason why the tire should not show just as much wear per sixteenth as it should without the driver brake. I believe that shoe to be a good one for steel-tired wheel, for either driver or car wheels.

Secretary Sinclair thought that the form of the wheel tread and flange is of much greater importance than the thickness of the tire. The data which has been brought out in regard to the relative wear of 3 and 4-in. tires may require a good deal of modification of our ideas as to the best thicknesses of tires, but in rolling a tire

COMPARISON OF LOCOMOTIVE TIRE IN AVERAGES.

No. of Engines.	Thickness of tire.	Class of service.	First Turning. No. of 16ths turned off.	First Turning. Miles to 1-16th.	Second Turning. No. of engines.	Second Turning. No. 16ths turned off.	Second Turning. Miles to 1-16th.	Third Turning. No. of engines.	Third Turning. No. 16ths turned off.	Third Turning. Miles to 1-16th.	Fourth Turning. No. of engines.	Fourth Turning. No. 16ths turned off.	Fourth Turning. Miles to 1-16th.	Fifth Turning. No. of engines	Fifth Turning. No. 16ths turned off.	Fifth Turning. Miles to 1-16th.	Removed. No. of engines.	Removed. Thickness of tire removed.	Removed. Total No. 16ths worn off.	Removed. Total mileage.	Removed. Miles run to 1-16th.
14 × 22 — 57. AVERAGE WEIGHT, 40,295.																					
7	3	P. & F.	4 4-5	14,487	6	5	11,135	4	7½	7,490	1	7	10,017				1	1½	24¼	137,254	5,602
9	4	Pass.	9 1-5	8,338	3	10 1-5	4,468														
15 + 22 — 41. AVERAGE WEIGHT, 50,150.																					
8	3	Switch.	7 2-5	6,864	8	10⅞	4,257	1	8	5,032							7	1 2-5	24 4-5	136,313	5,541
7	4	"	7¼	5,249	5	6 3-5	5,012	3	8 2-5	4,806											
15 + 22 — 57. AVERAGE WEIGHT, 43,560.																					
3	3	Pass.	6¼	17,323	2	8½	13,761	1	4	17,479	1	2	6,570	1	2½	11,611					
3	4	"	6⅓	12,658																	
16 + 22 — 44. AVERAGE WEIGHT, 59,238.																					
45	3	Switch.	10 3-5	5,035	35	9 3-5	4,422	9	8 4-5	3,327	1	7⅛	3,480				45	1 3-16	28 4-5	131,277	4,550
76	4	"	10 3-10	3,794	61	10 3-5	3,713	34	11	3,187	11	8 7-10	2,876	1	8¼	805	13	1 6-16	42¼	133,956	3,1 2
16 + 24 — 57. AVERAGE WEIGHT, 44,307.																					
26	3	P. & F.	7 2-5	10,237	25	5 4-5	11,307	16	5 3-5	8,793	10	5	7,631	3	5 1-10	11,250	15	1 5-16	25 2-5	243,285	9,553
13	4	"	6	7,561	5	8 9 10	5,950	1	9¼	3,947											
16 + 24 — 53. AVERAGE WEIGHT, 44,307.																					
93	3	Frt.	7 9-10	7,999	90	7 5-10	7,286	61	6 2-5	6,531	15	6 6-15	6,268	3	5¼	4,780	81	1 4-16	28 5-10	196,667	6,610
34	4	"	8 2-5	6,042	14	6 3-10	4,924	6	9 5 10	4,531	1	8	5,436								
16 + 24 — 63. AVERAGE WEIGHT, 47,250.																					
4	3	Pass.	3 1-10	15,735	4	9	8,069	1	7½	11,057											
1	4	"	9	9,431																	
17 + 24 — 53. AVERAGE WEIGHT, 48,784.																					
19	3	Frt.	6 7-10	9,755	19	7 3 10	7,454	13	7 12-13	6,284	3	7	7,176				15	1 5-16	27 7-10	209,287	7,555
26	4	P. & F.	7 9-10	6,764	10	8	6,592	1	7¼	5,388											
17 + 24 — 57. AVERAGE WEIGHT, 48 960.																					
63	3	P. & F.	7 2-10	10,601	61	5 5-6	9,487	41	4⅞	9,985	16	5 4-10	6,719	2	4¾	5,260	52	1 3-16	27¼	222,734	8,049
33	4	"	6¾	7,676	13	6¼	6,406	5	8 5-10	7,162	1	6	6,215								
17 + 24 — 63. AVERAGE WEIGHT, 52,353.																					
13	3	Pass.	4	11,967	11	6	10,781	7	3 4-7	11,795	6	7⅝	6,745	2	10¼	6,048	2	1 6-16	25 7-16	257,075	10,007
1	4	"	4	19,540	1	8¼	6,664	1	6	6,240											
18 + 24 — 57. AVERAGE WEIGHT, 53,883.																					
12	4	P. & F.	4 4-5	9,928	4	4¾	7,855	1	6¼	4,414											
SIX DRIVERS. 18 + 24 — 44. AVERAGE WEIGHT, 86,000																					
1	4	Switch.	6½	3,999																	
18 + 24 — 63. AVERAGE WEIGHT, 54,522.																					
7	3	P. & F	6 6-7	8,912	2	7¼	6,121														
20 + 24 — 44. AVERAGE WEIGHT, 91,308.																					
27	3	Frt.	4½	13,639	26	5½	8,809	9	4 3 5	9,142	3	4⅛	8,673	1	1⅛	9,287	2	1 1-16	27	189,653	7,024
10	4	"	5 4-5	5,548	2	5	4,979										4				

If any such members are present I should be glad to hear them state how the wearing service of such tires compared with tires of less thickness.

Mr. John Mackenzie (N. Y. C. & St. L.) favored adopting the same section of tire for a locomotive as had been made standard for a car wheel.

Mr. R. W. Buschnell (B., C. R. & N.) favored standard sizes of driving wheel centers, and was adapting his engines to the standards adopted.

Mr. H. L. Cooper (L. E. & W.) has 24 engines running with 4 inch tire. Some of those had been running four years, and two sets had been turned twice. Could not see any difference in wear it would be much more economical, but according to Mr. Rhodes' figures, here is a 3-inch tire that gives in round numbers 130,000, and a 4-inch tire, which is 33 per cent. greater in weight, that gives only about 2,000 miles more. Now, if there was nothing coming into the account but just the first cost of the tire, the 3-inch tire is the cheapest ; but that is not all, those 4-inch tires wear so much faster than the others that you have got to take them into the shop and turn them oftener. I should say from this statement that the 3-inch tire was far the cheaper to use. I see my friend Chapman (Midvale Steel Co.) here, and I hope he will profit by these figures, and he must say to his people, "You have got to make a 4-inch tire just as good as a 3, equal in the same rolls can be used for a 3-in. or for a 4-in. tire ; so if we settle to have the Master Car Builders' section of wheel tread the thickness of tire can be settled afterward, when experiment and experience have fully demonstrated what is the best thickness.

Mr. Quayle moved that it is the sense of this meeting that the Master Mechanics' Association ought to adopt the section of tire adopted by the Master Car Builders' Association.

Mr. McKenzie : That refers, I suppose, to the flange and the shape of the tread of the wheel ?

The President : I so understand it.

The motion was carried.

Discussion of this subject was closed.

RULES OF INTERCHANGE OF CARS.

The discussion on this topic was then taken up.
Secretary Sinclair read the following letters:

MINNEAPOLIS & ST. LOUIS RAILWAY,
SUPERINTENDENT'S OFFICE,
MINNEAPOLIS, Minn., Oct. 25, 1886.

Mr. Angus Sinclair, 175 Dearborn street, Chicago, Ill.:

DEAR SIR: I am in receipt of circular letters in regard to the business coming before the Western Railway Club. I shall hardly be able to attend any of the meetings, but there is one question in regard to the matter of car inspection which I would be glad to have brought up, and the following letter which I recently addressed to one of our connecting roads will explain—the object being not only to protect employés from danger, but to protect railroad companies from liabilities for such results:

"We have found it necessary to issue some new orders to our car department in regard to the inspection and receipt of cars from connecting lines in order to guard against personal injury to employés. I trust that you will take the necessary action with your connections and will avoid any unnecessary delay at ——.

The instructions issued by Mr. Wilson (M. C. B.) to his car inspectors are as follows: No car, loaded or empty, must be received or permitted to go forward, having defective ladders, ladder-rounds, hand-holds or running boards, rendering them dangerous to the men engaged in handling them. No exception must be made to these rules."

The party to whom my communication was addressed objected to the ruling very decidedly, claiming that it were better that the railroad companies should assume the risk rather than the trouble it would give them to enforce such a rule.

Yours truly,
T. E. CLARKE, Supt.

A second letter from Mr. Clarke, dated Nov. 6, says: "I beg to trouble you with one more question. A car belonging to one of our connections brought to Minneapolis, delivered to the A & B road, and by them delivered to the C & D road, who delivered it to us loaded with grain, to go over the line of the company owning the car. When the car was delivered to us it had foreign draw-bars. When we offered it to the owner it was refused on that account. We referred the matter to the C & D road, who refused to have anything to do with it, claiming that they were not bound by any rules established by custom or the Master Car-Builders' Association to carry in stock a large amount of material in draw-bars, supposed or known to be standards of a great many different lines, in order to be equipped for any foreign car which might require its own draw-bar to be replaced. Similar cases between the same companies and under the same circumstances have come up several times heretofore. It has not only been a perplexing matter for us to handle, but a very aggravating one as well. Now, if the C. & D. road were governed by any established rule or requirement, and referred back to the road that delivered them the car, we might be able to locate the damage and responsibility. But this they decline to do, claiming they have a perfect right to receive the car if it is in good running order, and that they are not supposed to have any knowledge of the draw-bars as to whether they are the standard of the road owning the car, or of any other road.

Will you kindly give me your opinion upon the subject, and, if it is worth while, let it come up for discussion in the NATIONAL CAR-BUILDER or Western Railway Club. We are tired of the bother."

Mr. Rhodes was requested to open the discussion. He said: The letters Mr. Sinclair has just read have a bearing on the rule we are to discuss to-day, and I think they might properly be referred to the committee who have the rules under consideration, and they will take such notice of them as may seem proper. The rules that we are to discuss to-day are 4, 5 and 6, which pertain to the defect cards, Rule 7, referring to roofs, and Rule 8, regarding locks. Referring to the history of these rules, the rule adopted in 1878, at St. Louis, reads: "In case a car under load in transit has defects that do not render it unsafe to proceed on its journey before being repaired, the inspector may make a note of such defect, and such car will be received back in same condition, and may be receipted for in bad order; but all such cars shall be returned without load to the road on which the damage was done for repairs." The important clause is that such cars are to be returned without load to the road on which the damage was done. At the meeting of 1883, at Chicago, the provision in the rule as to cars being returned unloaded was omitted, and the rule was made that only the company owning the car should be allowed to make the repairs. At the meeting held in 1885 at Old Point Comfort the rule was changed to read: "Any company finding a car with card on it may make the repairs noted by the card and make bill for the same to the company putting on the card, the card to accompany the bill as a voucher for the work done. All cards shall be printed and filled in on both sides." That is a very proper provision, it seems to me, that the card shall accompany the bill as a voucher for the work done. Rule 6 as adopted at Niagara in 1886 is practically the same as the last: "Any company finding a car with a defect card attached may make the repairs noted by the card and render bill for same to the company attaching card; the card to accompany bill as voucher for the work done." The defect card is undoubtedly causing a good deal of trouble. Some have even proposed to abolish it altogether, on account of the exacting requirements and responsibility it imposes. Mr. Johnson proposes three remedies: (1) The establishment of a joint inspection. (2) A number of cards signed in blank from each of the different companies, to be used in case of old defects or mixed material, the same to be reported to the owner of the card. (3) The adoption of two bad order cards, one authorizing repairs, the other recording old defects or mixed material, without involving any responsibility for the same. I favor the last proposition, and will confine my remarks to it, first suggesting that the cards be very nearly identical, except that one be on buff card, the other on blue, the latter to have the last word "defects" crossed out and the words "old defects or mixed material" added. I have prepared the following form:

(Name of road.)

Car No.......... Date..........

Initial.......... Line..........

Will be received at any point on this company's line, with the following old defects or mixed material:

Fill in on both sides with ink or indelible pencil and attach securely to the inside cross-tie timber.

This blue card seems to command more special attention because, since 1884, when any company was allowed to make bills for a carded car, a card something of the proposed type has been forcing its way. When we investigate our standards in the construction of cars and locomotives and find that shop practice persistently refuses to follow, it is the clearest proof there is some change needed in the standard, so we think with our defect card. There is probably no one present who has not within the past couple of years come across defect cards with a note written across the face, "This is not an order for repairs." We recently had what appeared a very unwarranted action—a Western road in Kansas refused from another western line some C., B. & Q. stock cars on account of mixed journal boxes, unless defect cards were given. This the other line refused. The loads were transferred, and the cars headed home. We have hundreds of cars running with these mixed journal boxes; the inspectors in our immediate neighborhood are aware of it, and we have no trouble. A blue defect card would have settled the dispute between the two western lines referred to, without involving either company in any expense. This is only one of many cases that might be cited. The blue defect card would have settled the trouble of the gentleman in Minneapolis, referred to in his letter.

Rule 7 reads, "Roofs lost from cars on account of faulty construction shall be replaced on cars at the expense of the owners." Some of the members may ask what the proper construction of this rule is. If you will keep a file of the Master Car Builders' proceedings you will often be able to get information as to the present rules. Last year the rule read as follows: "Roofs lost off cars while in transit, and which, upon examination, show faulty construction, namely, the ends of the carlins improperly fastened to the plates, tin roofs improperly cleated down, or rotten carlins or plates, the owner of said car or cars shall be at the expense of replacing the roof." It does not follow that every roof "lost off" is faultily constructed; it may be due to a wind storm or other unavoidable accident, which has unroofed some of their own cars as well as the neighbor's cars, and it would not be proper to write to the neighbor and ask him to put on that roof. Some roads argue that in those cases the owner of the car is the one who is responsible. We do not think so. It is true that freshets and fires and wind storms are something that we cannot control, but we take this view, supposing we did not have these cars belonging to our neighbor on our line, whose would we have had? They would have been our own, and we would have had to stand the loss without question, and we think that that should be borne in mind in regard to roofs lost from cars. It doesn't necessarily follow when roofs are lost that the owner of the cars is to pay for them.

Rule 8, "Locks on cars are at owner's risk," hardly seems to require any remark, because locks are not to be considered a part of the proper equipment of a car.

In order to get this matter before the association, I would move: That it is the sense of this meeting that two defect cards be recommended to the Master Car Builders Association, one to be a buff card, covering defects for repairs, the other to be a blue card, recording old defects and mixed material. Seconded.

The President: This motion now up for discussion will develop some important matters. We have with us the president of the New England Club. I think the members would all be glad to hear from Mr. Marden on any subject connected with the topic under discussion.

Mr. Marden: The subject of inspection of cars and the interchange of cars seems to be agitating the whole country, and it is well that it is so.

The subject is something we can talk about, if we could only act understandingly. We have had a great deal of trouble in the interchange of cars. We want to get our cars in such condition, and have our inspection so uniform, that when you load a car here in Chicago it shall go through to Boston without being detained on the road; in other words, we want a uniform system of inspection. The traffic manager secures his freight, it is loaded in the car for its destination, it starts out on the road, and is liable to be side-tracked and lie 8 or 10 hours waiting for some trivial matter which ought to have been attended to before the car started. Mr. Marden mentioned a case where a car was detained 12 hours at one inspection point through a misunderstanding, and got to Boston too late for the boat the freight was consigned to. He continued, we may discuss our rules and get them in the best possible shape for our own inspectors, we may say what repairs ought to be done on the cars and what kind of inspection ought to be given at different points, and we may say what roads shall repair the roofs that are blown off, and what roads shall pay for the different kinds of draw-bar or for a cracked wheel, yet I assure you that unless we make some arrangements by which the car shall get to its destination promptly, we are not accomplishing the desired object. The inspectors at different points do not agree—a car that will pass one point will not pass another; and I appeal to you if we should not look for some way out of our difficulty. When a car is loaded at Boston it should go through to Chicago without detention, unless it is broken on the line in transit. There is no reason for the prevailing delay. Roads in the same line ought to have a line inspector, and that is what will have to be done sooner or later. The cars that run over the line should be under the inspection of one man, and he should report only to the heads of departments, and they should make the rules to govern his inspection. The business of this man should be to see that cars are not loaded on that line but what shall go through, and when those cars are loaded no inspectors along the line shall prevent their going through. I think a system of this kind will be experimented with soon.

After some further discussion, in which Messrs. Johnson and Verbryck joined, the motion made by Mr. Rhodes was carried, and the meeting adjourned.

New England Railroad Club.

At the regular meeting of the club, Nov. 10, Vice-President Lauder presided, and 65 members were present.

RULES OF INTERCHANGE.

The discussion of this subject, which was begun at the October meeting, was continued.

It was voted, as the sense of the meeting, that that portion of the 11th clause of an unofficial interpretation of the rules recently prepared to assist inspectors, reading as follows, "or when brake shoes are worn down to bolt head or key bolt (when head and shoe are combined), they shall be considered worn out and rejected," should be stricken out.

The Chairman: The first part of Clause 14 is as follows: "Brake beam fulcrums (cast iron) secured by 2 bolts and nuts to brake beam, when casting is cracked, reject."

Mr. Soule: Nuts holding the bolts of the lever are often cracked, leaving the bolts and castings intact, and such cracks do not affect the safety of the car sufficiently to throw it out, when loaded.

Mr. Adams: A new one can be put in in five minutes.

Mr. Soule: There is but a small space there for a man to work. With inside brakes on, a man has to lie on the track and reach up behind; and I wouldn't care to send a man under a train to do that work; and besides, it entails delay.

Mr. Adams: The fulcrum might be in a safe condition, but I am in favor of having everything sound. I don't believe in broken irons of any description.

Mr. Chamberlain: I think if that is cracked through there (illustrating), the fulcrum would be affected, and the tendency would be to loosen the bolts and crack the iron where the bolt-hole is. Such cars, if passed, would never be repaired, some rod would finally pull out, and a new casting must be put in.

Mr. Adams: A broken iron is weakened. We should keep the cars in the best possible order, and not to allow cars to run which are not in good order. This idea of stopping freight and blocking the way has been a great bugbear with many people, but the general officers believe that it is of the first importance to have our cars in good order and sound condition, and that this will facilitate the movement of freight very largely; but if we leave them at loose ends, and let this and that and the other thing go, we are entailing upon the transportation department those difficulties which obstruct the rapid movement of cars.

Mr. Blackall moved that the portion of Clause 14 under discussion should be stricken out. Defeated.

The Chairman: "The remainder of Clause 14 is as follows: Wrought-iron fulcrum to be secured by nut lock or jam nut."

Mr. Soule: Suppose a car came along with one nut on?

Mr. Adams: It is a short job to replace those nuts. A man can put on one in half a minute.

The Chairman: Clause 15 is as follows: "Brake connection (lower) secured to brake beam with one nut each side of beam, secured to brake lever with key bolt and key (upper) secured to lever with either hook or key bolt and key, and to chain connection by hook. Inside brakes, the lower connection must be straight, the same conditions observed when brakes are applied to both trucks."

If I understand this clause rightly, it means that if these brake connections are not secured in the manner described here, the cars are to be rejected.

Mr. Adams: That is the intention.

The Chairman: In what other way could they be secured?

Mr. Adams: Many have no nut on the inside of the beam, and consequently the nut on the outside has nothing to hold it tight, and it rattles loose and the brake connection pulls out.

Mr. Hitchcock: We don't experience that trouble. I move to strike out the words "each side of beam." We always put a jam nut on the outer end in our cars.

The Chairman: It is moved that the words "each side of beam" be stricken out, and a nut with a jam nut, the two nuts checked together on the end of the connection rod, be substituted for the arrangement indicated in the clause.

Mr. Adams: We put double brakes on all the cars we build at present; and a majority of car-builders believe that all cars should have brakes on both trucks, because a train can be handled more easily, and the wheels are not so liable to slip.

The Chairman: We put brakes on all the wheels in our new cars.

Mr. Hitchcock's motion was not seconded.

The next clause of Rule 3 is *m*, as follows: "Brake wheels, step ladders, or running boards in bad order, or insecurely fastened." The interpretation of this clause is as follows: "Running board must be sound, and securely fastened to roof of car. Roof grab-irons, ladder handles on the side of the car, sill steps, ladder sides, rails and ladder rounds, all to be sound, and securely fastened to car body by either bolts or coach screws." The question is asked, "Would you fasten the ladder handles to a car with coach screws?"

Mr. Adams: Yes; if the coach screw is of proper size and length. A suitable coach screw is as secure a fastening as is a bolt, if put into good sound timber of good thickness, and in many cases better, because sometimes a nut will get lost off and the bolt come out. In securing iron to wood, the wood will shrink and let the nut loose, while the screw will hold. If a ladder round is properly put on, it will hold better with a screw than a bolt. A running board is not securely fastened by tin cleats nailed on and soldered to the roof. Every running board should be fastened by a No. 20 lag screw going into the ridge.

The Chairman: The next clause of Rule 3 is *n*: "Drawbars or attachments in bad order."

On motion of Mr. Adams, it was voted as the sense of the meeting, that the interpretation of clause *n* of Rule 3 in relation to drawbars or attachments in bad order, as set forth by the Boston & Albany and New York Central, should be adopted.

The Chairman: The first clause of the interpretation under this head is as follows: "Drawbars (wrought) when broken off outside of tenons, or cracked or broken in the opening of face plate, or in the angles of the pocket, or through rivet holes, or when filling is gone; (cast) when cracked or broken through pin-hole, or back of head, or when bolts or rivets gone when wrought pocket is used, reject."

Mr. Hitchcock: Thousands of cars run without any filling.

Mr. Marden: It depends upon the size and strength of the straps that the filling is put into. We passed a car where it was doubled up, the two straps near together, on account of the filling being gone. If the straps are of sufficient strength in themselves to resist the pressure, they might be safe enough to run with; but I have never seen a wrought-iron drawbar that was strong enough itself without the filling. It might do to send the cars to their destination if in fair condition when received.

Clauses 2, 3, 4, 5, 6 of the interpretation of Clause *n* of Rule 3 were read by the Chairman, and passed without discussion.

The Chairman: The 7th Clause is as follows: "Draw timber rejected when split or broken through bolt holes, and will be accepted with one draw timber bolt gone, when the remaining bolts are in good condition. When down, allowing a space of ⅝ in between the same and the draw sill, reject."

Mr. Soule: They frequently shrink more than ⅝ in., and cannot always be screwed up, as the timber must be cut off.

Mr. Adams: The draw-sills are not in proper condition if down ⅝ in. It would not shrink quite as much under the end timber, and would pass if you get it up to within ¼ in., but the bolts must be screwed up.

Mr. Fletcher: Would you reject a car, built with green timber and the bolts rusted in tight? They cannot be tightened when the car is loaded, and if rejected there will be a block all through the country. Such a car should be put in order, but it cannot be done on the track.

The Chairman: The Boston & Albany and New York Central roads interpret the Master Car Builders' rule in regard to drawbars or attachments in bad order to mean that a draft timber settled down from the draft sill so as to have a space of ⅝ in. between the two is in bad order and should be rejected.

Mr. Adams: This rule probably did not contemplate the matter of shrinkage; a great many cars come with broken draft bolts, and the draw stick gets down from that cause. That undoubtedly was mainly the thing to be covered here, and they could not make a rule to cover that absolutely and nothing else, and so fixed the space at ⅝ in.

Mr. Soule: It would be better to specify how many bolts should be there, than how many may be gone.

The Chairman: That rule and interpretation cannot be improved, because cars differ so in construction. They have been very lenient in allowing ⅝ in. space before rejection, because a loose draw, though a slight defect, may cause the whole rigging to be pulled out. The draw rigging should be kept in first-class condition, or rejected.

Clause 8 was read and passed by without discussion.

The Chairman: Clause 9 is as follows: "Drawbars that have wrought iron guides bolted to plank (called perch plank), secured to car body by a king-bolt passing through a wrought iron strip that is bolted to the plank, and wrought iron carry iron in the form of a yoke bolted to end sill, will be rejected."

Mr. Taylor: Many Northern lines are trying to get rid of that kind of drawbar, and have agreed to keep them at home.

The Chairman: They are mainly old roads in New England, old equipment built with the loose or perch drawbar, and are not worth new draw sills.

Mr. Adams: We have many such cars. We decided, two years ago, not to offer for delivery or receive any car with a loose drawbar.

The Chairman: The interpretation in regard to Ames drawbar is as follows: "Ames drawbar must be free from cracks or breaks, secured to wrought pocket by two bolts or rivets, with pin, link, trunnion, lever and chain, all to be in place and secured according to original construction."

On motion of Mr. Hitchcock, it was voted to reject this interpretation of this portion of Rule 3, on the ground that the point is covered by Rule 2.

President Marden here took the chair.

Clauses *o*, *p*, *q* and *r* of Rule 3 and the interpretation of the latter were read and passed by without discussion.

The President: Clause *s* of Rule 3 is as follows: "Special or general defects of bodies or trucks which render cars unsafe to run."

The first and second clauses of the interpretation of Clause *s* were read, but not discussed.

The President: The third clause of the interpretation is as follows: "Body bolster side bearings, when cast iron, must be in place and secured with two bolts and nuts; if wrought iron, with two coach screws or dog nails.

Mr. Blackall: Enforcing that third clause relative to two bolts on the side bearing would stop nine out of ten cars on some of our Western roads.

Mr. Adams: Every possible means should be taken to discourage the use of such cars, or wrecks will ensue. At a meeting of the general officers of the New York Central with the general officers of the Boston & Albany, they pledged themselves that the rule should be observed by each of those companies. We may make some concessions in exceptional cases.

Under the head of Trucks, in Rule 3, the interpretation (six clauses) was read and passed by without discussion.

The President: Rule 4 is as follows: "A car with defects which do not render it unsafe to run must be accepted, but in such cases the company to whom such car is offered may require that a defect card shall be securely attached to the car, preferably on the inside of cross-tie timber."

The interpretation is as follows: Cars that have old defects for which no provision has been made in the interpretation of the rules will be passed under check and notation, the receiving road to furnish the delivery road a copy of the same. All new defects must be carded as per Rules 4 and 5. No repairs will be made to a car so carded, unless absolutely necessary to return it in safety to the road applying the card."

Mr. Doran: There have been objections made by different railroads to applying cards, and I think the point is well taken, especially in regard to old defects.

Mr. Adams: We have adopted the plan indicated in the interpretation of Rule 4, but I don't believe in it.

Mr. Doran: We pass about 50 per cent. of the cars we receive under notation. Last year we received 300,000, and delivered 50 per cent. of them. We have 15 inspectors. I found in the month of June that of 15,000 cars that went from Albany in apparent good condition, when they reached North Adams junction, we had to repair 10 per cent. of them before they went on to the Middle Division; and of the west-bound, we had to repair 20 per cent. of 14,000 odd before they came to Albany; and when they reached Albany the New York Central threw out 50 per cent.

Rules 5 and 6 were read, but not discussed. They were accepted.

The President: The next is Rule 7, under the head of DEFECTS FOR WHICH OWNERS ARE NOT RESPONSIBLE, as follows: "Roofs lost from cars on account of faulty construction shall be replaced at the expense of the owners."

The interpretation is as follows: "When cars are delivered with defects as named herewith, they should be classed as ordinary wear, and received by owner, when there has been no evidence of severe usage. 1st. Brake heads or shoes worn out. 2d. Pedestals cracked. 3d. Center plates broken through plates or ring. 4th. Column guides and columns castings broken as shown in paragraph 2 of trucks. 5th. Bolster and spring planks broken. 6th. Truss rods on trucks and body broken. 7th. Bolsters and journal box springs broken. 8th. Spread trucks. 9th. Loose deadheads. 10th. Loose sheathing in side of car. 11th. Loose tin or board roof. 12th. Ends of car bulged out. 13th. Cars low of trucks when wheels come in contact with intermediate sills."

Mr. Lauder: As I understand this matter, what is printed after Rule 7 is not an interpretation of that rule, but simply an agreement between the Boston & Albany and New York Central roads.

Mr. Adams: This printing in italics or between inverted commas is an agreement between the roads.

The President: I understand that if we agree to the interpretations here given, we adopt them as the sense of this meeting.

Mr. Lauder: Yes, sir; for the guidance of the Master Car-Builders' Association at their next meeting.

Mr. Adams: Our General Superintendent told me yesterday that having sent these books containing the rules and interpretations to the various roads which connect with ours, he had received answers from six or eight superintendents, expressing themselves satisfied with them, and saying they would apply them on their roads.

Mr. Lauder: The action we take in this discussion will have quite an important bearing on the action of the Executive Committee of the Master Car-Builders' Association at their next meeting, with reference to revising their rules. Meanwhile, I don't understand there is any objection to any road adopting any of the rules and interpretations as printed here.

The President: What we desire is the sense of the members of the club in regard to the interpretation of the rules. I would ask Mr. Adams, in case he makes repairs of defects noted after Rule 7, if he would charge the expense to the owners?

Mr. Adams: We are allowed to by the rules of the Association as to roofs, but as to the other items I don't think we would be justified in so doing.

The President: Take the 11th clause, "loose tin or board roof."

Mr. Adams: We should probably tack it down with some shingle nails, and let the car go home. It comes under natural wear, which we don't consider ourselves responsible for.

Mr. Doran: When this matter was under discussion at West Albany, it was considered that these items after Rule 7 specified defects which were the result of ordinary wear, and the cars should be accepted when returned to the road owning them, the mileage received being sufficient compensation. So far as the entire interpretations are concerned, they are a matter entirely between the Boston & Albany and New York Central roads; if other roads adopt them they have made some headway.

Mr. Hitchcock: I think it important to define what ordinary wear is.

Mr. Lauder: We ought to take some action toward recommending the Executive Committee of the Master Car-Builders' Association to formulate some rules that would cover this point here, where certain old defects here specified are manifestly caused by usage, ordinary wear; and that such cars should be received back by the owners.

Mr. Adams: My understanding was, when the discussion of this matter by the club began, that when these interpretations were read in connection with the rules, if there was no objection to them, it should be considered as the sense of this club that they were correct. I move that this club recommend to the Executive Committee of the Master Car-Builders' Association the embodiment in their rules of what is appended to Rule 7 as printed, viz.: the paragraph relating to the delivery of cars with defects and the 13 items or clauses specifying various defects. Motion adopted.

Rules 8 and 9 were read but not discussed, but were adopted.

The President: Rule 10 is as follows: "Loose wheels may be replaced, or wheels out of gauge may be refitted, and charged to owners."

Mr. Lauder: That rule might be made to read, "Loose wheels may be replaced, or wheels out of gauge when rejected may be refitted by the road offering the cars for interchange, and charged to the owners."

Mr. Adams: Any road that accepts wheels out of gauge, perhaps ¼ in. wider than the limit of gauge allowed, should put them in order before it asks another road to accept them.

Mr. Lauder: We should refuse to receive a car with wheels out of gauge.

Mr. Adams: These offering the car have the advantage. They say "There is your freight; we have delivered it. The law would compel you as a common carrier to receive that freight."

Mr. Lauder: Suppose they offer you a car with a draw-bar gear?

Mr. Adams: If they have got it to a point where you ordinarily receive freight, you have got to receive it.

The President: You are right about the laws of common carriers, but our rules provide that the road shall deliver the cars in good running order. I think this matter of the receiving road being obliged to transfer the freight is all wrong.

Mr. Adams: I think if a contract is made in Portland, Me., to deliver freight in Chicago, that contract will hold the parties to deliver that freight, and if any one blocks the way and don't receive it, the law will hold him responsible.

The President: I understand that is the law of common carriers, but I think the law is wrong, that the receiving road shall transfer the freight. It gives a road a chance to keep and run its cars in poor condition.

A letter from the Secretary of the Western Railroad Club to the Secretary of the New England Railroad Club was read and placed on file by vote of the club.

On motion of Mr. Curtis, amended by Mr. Lauder, it was voted that a committee of three, consisting of the President, Vice-President and Mr. Adams, be appointed to attend the next meeting of the Western Railroad Club at their own expense.

Rules 11, 12 and 13 were read, but not discussed.

The meeting then adjourned to the second Wednesday in December at 2 P. M.

The subjects for discussion at the December meeting are: In the afternoon at 2 P. M., the Interchange of Cars; in the evening, Standard Size of Wheel Centers for Steel-tired Car and Engine-truck Wheels.

Railway Master Mechanics' Association.

The Secretary of the Association has issued the following circulars:

PISTON ROD, VALVE STEM AND CYLINDER PACKING.

The undersigned having been appointed a committee for the purpose of obtaining information relative to the practice of Master Mechanics in regard to the use of piston rod, valve stem and steam cylinder packing upon locomotives, respectfully solicit replies to the subjoined inquiries.

There is no part of the mechanism of the locomotive where so much loss in money value actually occurs as that incurred by the constant blowing away of steam, which must take place where imperfect or defective packing rings are employed, which not only escapes inert into the exhaust, but during part of the movement of the piston, actually exercises a retarding influence upon the engine. It is, therefore, our plain duty to make the subject of packing rings an important and constant study, and to be willing to impart any special information to others for the general good.

In order to make a full report embodying the views of the membership, we request you to make replies to the following as early as may be possible:

1. Do you use cast-iron for packing rings?
2. What width of ring is your general practice?
3. What thickness of ring when first applied?
4. How much larger than the cylinder are the rings when first applied?
5. Do you, after turning the rings up, cut them, spring them in, clamp them and turn them to the correct diameter of the cylinder?
6. Do you make the ring heavier opposite to where it is cut open?
7. What is your usual plan for breaking joints?
8. Do you use springs to assist in getting the packing ring out, or depend upon the elasticity of the ring assisted by steam?
9. Do you use more than two rings in any of your engines?
10. Have you tried steel, phosphor-bronze, or gun-metal, and if so please state results as far as thus tried?
11. Do you use Dunbar or any patented style of cast-iron packing rings? If so, please give name and address of patentee.
12. Do you use solid piston-heads and spring the ring into the grooves or follower and hub, T, or bull rings? Or, if both, state which you think preferable.
13. What is your general practice for adjusting the piston in the center of the cylinder, do you turn the T-ring out larger than the spider and line up with sheet-iron, or set screws, or clamp the T-ring with the follower to hold the piston in center of cylinder?
14. Do you drill small holes in the piston and follower to set out the packing?
15. How much side shake do you allow when rings are new, or do you make them close fit between the T-ring and follower or piston?
16. What is your observation of the wear on cylinders incident to the use of steam packing as compared with the old style of brass-spring packing? Do you notice that the cylinders are worn away more rapidly near the ends, and do you regard this irregularity in the diameter to be any disadvantage in a packing which is flexible and automatic in its adjustment? How often do you think reboring necessary?
17. Do you permit the practice of peining the ring when worn to enlarge them, or have you some special plan for enlarging them?
18. Do you use any special grade of cast iron for packing rings? If so, state character of metal.

1. Do you use hemp exclusely and in preference to other packing?
2. Do you use any of the prepared fibrous packing, and if so, what kinds, and how do they compare?
3. Can you give an approximation to the cost of packing per 1,000 miles for pistons and valve stems with hemp, or with any fibrous packing you may use?
4. Do you use any form of metallic packing for rods and stems? If so, please state kind and maker's name, or if your own design, please furnish a tracing or print of the device, giving particulars of cost of manufacture, and length of time or number of miles between renewals, also composition of metal.
5. Do you find it more difficult to keep metallic packing tight on valve stems than you do on piston rods? If so, please give your opinion of the cause.
6. Any special information not enumerated above will be gladly accepted by the committtee.

Address replies to J. W. Stokes, Pana, Illinois.

HENRY SCHLACKS,
ALLEN COOKE,
J. W. STOKES,
Committee.

WEAR OF LOCOMOTIVE TIRES.

The undersigned desire answers to the following questions:

1. Has the locomotive engineer any control over the wear of tires?
2. If so, in what way?
3. What is your method of determining the wear of tires?
4. Do you have regular engineers on your locomotives?
5. Will tires run longer between turnings with regular engineer than with different engineers?
6. Is a free use of sand desirable or not as regards the wear of tires? Give figures if possible, if not the experience of yourself or engineers.

All communications should be sent to John Mackenzie, Supt. M. P., N. Y., C. & St. L. Ry., Cleveland, Ohio.

FRED. B. GRIFFITH,
J. S. GRAHAM,
JOHN MACKENZIE,
Committee.

LOCOMOTIVE TRACTION INCREASERS.

The undersigned, a committee appointed by the Master Mechanics' Association to investigate the various types of Traction Increasers and to report upon to their relative merits, and the conditions under which their use can be recommended, respectfully ask that you will reply to the following questions:

1. Have you had any experience with devices for increasing the tractive power of locomotives.
2. Under what conditions would you advise the use of such a device?
3. What do you consider the best known arrangement for this purpose, and what is the cost of its application and maintainance?
4. Is there any good objection to utilizing the weight of the tank for this purpose?

Please address, R. H. BRIGGS, Chairman,
Argentine, Kansas.

CONTROL OF ENGINEERS OVER THE WEAR OF DRIVING-WHEEL TIRES.

The undersigned desire answers to the following questions:

1. Has the Locomotive Engineer any control over the wear of Tires?
2. If so, in what way?
3. What is your method of determining the wear of Tires?
4. Do you have Regular Engineers on your locomotives?
5. Will Tires run longer between turnings with Regular Engineer than with Different Engineers?
6. Is a free use of Sand desirable or not as regards the wear of Tires? Give figures if possible, if not the experience of yourself or engineers.

FRED. B. GRIFFITH,
J. S. GRAHAM,
JOHN MACKENZIE,
Committee.

All communications should be sent to John Mackenzie, Superintendent of Motive Power, New York, Chicago & St. Louis Railway, Cleveland, Ohio.

TWENTIETH ANNUAL CONVENTION.

You are hereby notified that the Supervisory Committee have decided to hold the twentieth annual meeting of the American Railway Master Mechanics' Association at St. Paul, Minn., on the third Tuesday in June, 1887. Details of arrangements will be made known later.

J. H. SETCHEL, Secretary.

WILLIAM WOODCOCK,
R. H. BRIGGS,
J. JOHANN,
GEO. RICHARDS,
J. H. SETCHEL.
General Supervisory Committee.

Improved Stock Cars.

An experimental trip was begun Oct. 16 with a train of improved stock cars, built by the Ensign Manufacturing Co., of Huntington, W. Va., under the patents of its Vice-President, Mr. F. E. Canda. These cars are equipped with the American Brake Company's brake, the Hein coupler and the suspension truck. The cars are 39 ft. long, and weigh about 28,000 lbs., while ordinary stock cars are 34 ft. long and weigh about 22,000 lbs. The Ensign car is provided with flexible partitions, something like the familiar flexible desk covers, which are let down from the roof after the cattle are loaded, dividing the car into eight compartments, with two cattle in each. There is a rack for hay and a trough for water on each side of every compartment, made to fold up against the side of the car when not in use. Water is supplied either from a tank carried under the car, or from a tank on the road, and the cattle can either lie or stand.

The train which started from Chicago, Oct. 26, had 22 of the Ensign cars, equipped as above described, and three ordinary stock cars, the latter taken in order to compare the effect of the two vehicles on the cattle.

The train reached New York 61 hours after leaving Chicago, the usual halt having been made at Buffalo, in order to rest and feed the cattle in the common stock cars. With solid trains of the improved cars it is intended to run through without stopping in 42 to 48 hours. All the braking was done with the American power brake, and one "emergency stop" was made to avoid what seemed to be danger of a collision. Mr. Canda reports that the performance of the brake in this case and on other occasions, both in quick stops and in handling the train, was altogether satisfactory, and that the cattle were not appreciably affected even by the emergency stop, which indicates that close coupling may have greatly improved the action of this buffer brake.

The effect on the cattle is reported as follows, the weights in pounds of four car-loads in each kind of car, when shipped from Chicago and when delivered at New York having been:

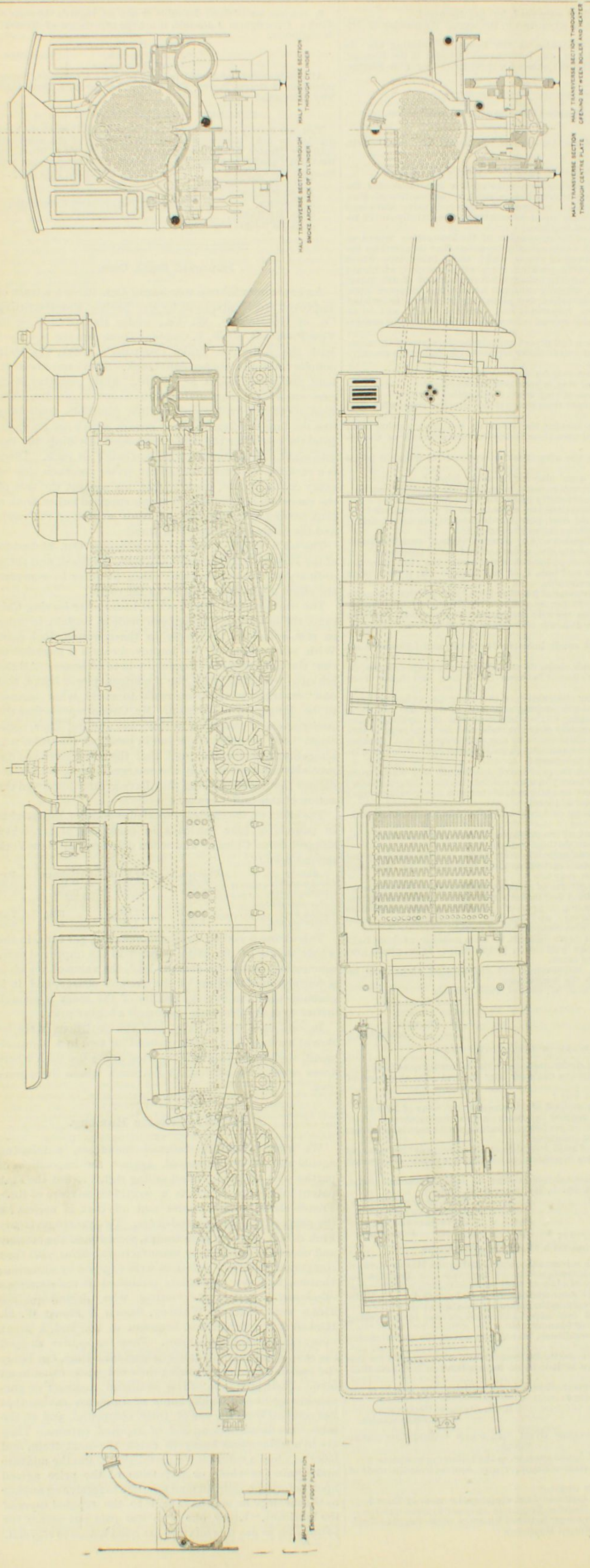
	Chicago.	New York.	Shrinkage.	P.c.
Total:				
Ensign cars	90,630	88,480	2,150	2.38
Common cars	86,950	83,260	3,690	4.27
Per animal:				
Ensign cars	1,416	1,382½	33½	2.38
Common cars	1,359	1,301	58	4.27

This shows a saving in shrinkage of 1⅞ per cent. in the whole weight of the cattle carried in the improved cars, amounting to 424 lbs. per car-load, the value of which is a considerable fraction of the freight charge, and it is claimed that the average quality of the meat is enough better to make the cattle command a higher price.

In one case where only half the partitions were let down, leaving four cattle instead of two in a compartment, the loss in weight is reported as 25½ lbs. each where there were four against 13 lbs. each where there were two.

A Patent Lubricator Humbug.

We wish to caution railroad managers, purchasing agents and others interested, against the impositions of parties who are going round selling rights to use the Fink patent lubricator, which is a worthless mixture of lime, French chalk, potash, water and oil, that is useless for the purpose it is recommended for. Two years ago, Henry Fink & Son, who are pure frauds, went round the country and cheated a great many manufacturing firms with their compound, and their practices were exposed by numerous victims, and the particulars published in the *American Machinist*. Among the victims who denounced the Finks were Pratt & Whitney, Brown & Sharp, W. H. Haskell & Co., Schleicher, Schumm & Co., and a great many other well known firms. These exposures stopped the sale of the fraudulent compound for a time, but lately the rascals have been working their old tricks on railroad men. Their plan is to call on a railroad manager or purchasing agent and make claims of immense saving that has resulted from the use of their compound, and at the same time display a long list of reputed patrons. They are in a tremendous hurry to catch the next train, and labor to close a contract for permission to use the mixture and obtain the whole or a portion of the price agreed upon before the railroad man has time to receive an answer to the message he may have sent to the reputed users of the lubricant. Every one who has paid out money for permission to use this mixture has good reason to regret it.



JOHNSTONE'S FOUR-CYLINDER LOCOMOTIVE.

Johnstone's Four-Cylinder Locomotive.

The locomotive, illustrated in the annexed engravings, was designed by Mr. F. W. Johnstone, supintendent of motive power of the Mexican Central Railway, for pulling trains over the steep moun tain grades on the Gulf and Pacific branches of the road. It is a new departure in locomotive design, the weight of the tender being utilized for the purpose of giving adhesion to driving wheels placed under it. An ordinary four-wheel truck is placed under the smoke-box, and another under the deck, these secondary trucks being pivot d in the ordinary way, but the center-pin instead of being attached to a rigid frame, is attached to the driving-wheel truck frame, which is itself pivoted at a center bearing. Both engine and tender are carried upon the same rigid frame, but a marked peculiarity and divergence from previous methods is, that while the cylinders are attached to the main frame, the groups of wheels to which they impart motion are carried by a separate and swiveling frame, so that on curved portions of track the longitudinal axes of the cylinders and the truck frames are parallel. In order to allow for the angle between the plane of motion of the crank-pin and the longitudinal axis of the piston-rod, consequent upon this arrangement, the strap ends of the forward ends of the main connecting and tension rods, are pivotally connected to the brasses, so as to allow of a horizontal vibration, while at the same time the brasses may be filed or keyed up without affecting this movement of the rods. An arrangement of a similar character is applied to the eccentric rods for the same purpose.

The piston-rod cross-heads are not connected directly to the crank-pins by connecting rods, but act through an intermediary system of levers, which not only allows of the swiveling of the truck-frames without interfering with the transmission of power, but also permits a crank-pin stroke greater than that of the pistons, and consequently a reduced piston speed relatively to a given speed of the driving wheels. The cross-heads carry pivoted to them vertical rocking levers, to the lower extremities of which are attached connecting rods leading to the crank-pins of the center pair of wheels which they drive. The upper extremities are connected with the corresponding extremities of similar levers of equal size oscillating on journals in boxes attached to the main frame, and placed but a short distance from the cross-head levers, with the centers on the same horizontal axis as these. To the lower extremities of these secondary levers are attached tension rods, which, at their other ends are fastened to pins on the truck frame, so that as the points of attachment to the truck frame move back or forward as the truck swivels on the curves, the forward end of the main connecting rod is moved to a corresponding extent by means of the cross-head lever.

The driving wheels under the tender are driven in a similar way, the power being transmitted from cylinders bolted to a casting which forms the foot-plate.

The boiler is of the ordinary straight type, but the fire-box being between the two truck frames is not restricted in width. In regard to this form of engine, Mr. Johnstone writes us: "I am now making drawings of an engine embodying these principles, but with only two cylinders and six wheels connected, and two four-wheel trucks under the tank. I wish to try and introduce this lighter engine for freight and heavy passenger service, as it is more generally adapted for all roads having heavy traffic than the larger engine.

"The main object obtained in this design is a very large fire-box, which is suspended without overhanging. The fire-box of the engine I am now designing will be 6 feet long and 8 feet wide, cylinders 22 × 18 inches, which is equal to 19×24 inches. With so large a fire-box very large nozzles can be used and no netting will be necessary."

The leading dimensions of the engine illustrated are:

WEIGHT AND GENERAL DIMENSIONS.

Gauge of road	4′ 8½″
Total weight of locomotive in working order	185,000 lbs.
" on driving-wheels	140,000 lbs.
Total wheel base	52′ 1″
Distance between centers of drivers	5′ 0″
" " cylinders	7′ 6″

CYLINDERS, VALVES, ETC.

Diameter of cylinders and stroke of piston	22″ × 18″
Stroke of crank-pin on drivers	36″
Size of steam ports	16″ × 1¼″
" exhaust ports	16″ × 2½″
Greatest travel of slide valves	5½″
Outside lap	¾″
Inside lap	1/16″
Lead of slide-valves in full stroke	1/16″
Sectional area of opening in each steam pipe connected with cylinders	19½ sq. in.

WHEELS.

Diameter of drivers	57″
" truck wheels	28″
Size of driving axle journals	7″ × 8″
" truck axle journals	4½″ × 8″
" main crank pin journals	4½″ × 4½″
" coupling rod journal on main pins	4¾″ × 3½″
Other coupling rod pin journals	3½″ × 3½″

BOILER

Description of boiler	Straight.
Inside diameter of smallest boiler ring	63″
Number of tubes in boiler	304
Diameter of tubes in boiler outside	2¼″
Length of tubes in boiler over tube plates	12′ 1″
Number of tubes in heater	388
Diameter of tubes in heater outside	2¼″
Length of tubes in heater over tube plates	6′ 3″
Distance between centers of tubes in boiler	2⅞
" " " " heater	2⅞

Size of fire-box inside, length × width × depth from under side of crown plate to bottom of mud ring. 72" × 84" × 82"
Maximum working steam pressure per sq. inch ...... 140 lbs.
Grate surface ...... 42 sq. ft.
Heating surface in fire-box ...... 204 sq. ft.
" " of the inside of tubes in boiler ...... 1,916 sq. ft.
" " " " " heater ...... 1,322 sq. ft.
Total heating surface ...... 3,442 sq. ft.
Height from top of rails to top of chimney ...... 14' 6"

TANK.

Water capacity of tank in gallons 4,000
Coal capacity ...... 12,000 lbs.

Some Ancient Railway Cars.

Most students of mechanical science have seen the works and investigations of Dr. Desaguliers quoted, but comparatively few have seen the books published by the author named. His principal book is "A Course of Experimental Phylosophy," published in London in 1734. Mr. Charles T. Brown, patent attorney of Chicago, who is a diligent student of engineering themes, has a finely-preserved copy of the work mentioned, and we have lately enjoyed the privilege of reading the book. It shows that scientific men one hundred and fifty years ago were not so ignorant of mechanical subjects as the modern world believes they were. Desaguliers understood the atmospheric engine thoroughly, and it is curious that to a man of his engineering knowledge the thought it did not occur that cooling down the cylinder at each stroke was a great waste of energy.

For railroad men, the most interesting portion of the book is, "A Description of the Carriages made use of by Ralph Allen, Esq., to carry stone from his quarries, situated on the top of a hill, to the water side of the river Avon, near the city of Bath." This is undoubtedly the earliest illustrated description of railroad machinery. The track is spoken of as a "wagon-way," and is alleged to be a great improvement on those used at New Castle in connection with coal mines.

The carriages are said to consist of a strong floor of oaken planks three and a half wide and about 13 feet long, strengthened above by several ribs to defend it from the stones that lie upon it, and fixed upon four beams of the same wood about 4 inches square and 14 feet long. At six inches from the ends are fastened the fore ends, and back ends. To these two ends, when occasion requires, may be fastened sides made of planks 13 feet long. At right angles under the beams are two strong timbers, well strengthened and plated with iron. At the ends are two semi-cylindrical pieces of brass which serve as collars for the axletrees of the wheels, which, being well greased, turn with very little friction."

The axletrees are described as being of iron about three inches diameter, one end being round and the other end square. The wheel set on the square end of the axle is the wheel to which a lever is applied to retard the motion when going down hill. The wheels are of cast-iron, with flanges that go inside the rails as in modern car wheels. Each carriage was said to have cost thirty pounds sterling, and was capable of carrying four tons of stone. These carriages, described in a book published one hundred and fifty years ago, have a remarkable likeness to the wagons in use on British railways to-day.

An Evening School for Shop Workmen.

We recently visited an evening school conducted for the benefit of the apprentices and workmen connected with the railroad shops of the Burlington, Cedar Rapids & Northern Railway, at Cedar Rapids, Ia. A room for holding the meetings is provided by the company in the general office building. The leading spirit in the work is Mr. R. W. Bushnell, the master mechanic, and his efforts are warmly supported by Mr. A. A. Zeh, chief draftsman, and Mr. Allan McDuff, machine shop foreman. The pupils receive instruction in drawing, arithmetic and applied mechanics. More attention has been devoted to arithmetic than to the other subjects, and the lessons are so arranged that the problems can be applied to the daily work the men are engaged in. We hear a good deal of talk about the necessity for manual instruction for boys in school, but perhaps a more urgently needed reform is a change in the arithmetical problems given to boys in school. The books are made up as if this was a nation of clerks and lawyers, the future mechanic seldom finding problems that will apply to his work. The problems given by Mr. Bushnell and his assistants relate to a great extent to shop practice, to the proportion of pulleys required to transmit certain speed to tools, to the power and leverage required for certain weights raised by screws or by hydraulic jacks, etc. The evening we were at the school the pupils received the following sum: Suppose an engine with cylinders 17 × 24 inches, with the connecting rod attached to a drum 48 inches in diameter, is set at the top of an inclined plane. With an average mean effective steam pressure of 60 pounds, what force will the engine exert on the rope with a piston speed of 280 feet per minute? What weight will the engine draw up an incline 660 feet per mile, allowing 8 per cent. for friction of engine and 9 pounds per ton for friction of load? What will be the horse-power of the engine? What will be the amount deducted from the power of the engine for friction? What will be the force due to gravity?

Character of Boiler Waters on the Chicago and St. Louis Divisions of the Chicago, Burlington & Quincy R. R. Co.

The following tables give, in the order of their standing, *all* the boiler waters on the above-mentioned divisions:

I. CHICAGO DIVISION.

Watering Stations.	Source.	Incrusting solids. Grains per gal	Non-incrusting solids. Grains per gal	Number of lbs. incrusting solids per standard tank of 2,750 gals.	Comparison with Lake Michigan as unity
Chic go	Lake Michigan	7.3052	0.6260	2.87	1.0
Riverside	Des Plaines River	10.666	1.365	4.19	1.5
Fulton	Well	11.529	7.063	4.53	1.6
Aurora	Fox River (av. of 7 anals)	12.794	3.805	5.02	1.8
Mendota	Artificial or surface pond	12.929	1.855	5.08	1.8
Denrock	Well (av. of 2 anal's)	13.634	1.956	5.35	1.9
Earl	Indian Creek	13.937	2.391	5.48	1.9
Yorkville	Fox River	14.183	2.216	5.57	1.9
Streator	Otter Creek	14.346	2.449	5.64	2.0
Plano	Little Rock Creek	14.357	1.764	5.64	2.0
Sheridan Junc.	Well	14.521	2.974	5.70	2.0
Rock Falls	Rock River	16.072	2.001	6.31	2.2
Deer Grove	Well	16.696	0.169	6.56	2.3
Amboy	Inlet Creek	17.932	1.149	7.04	2.5
Ottawa	Artesian well (av. 2 anal's)	18.183	5.726	7.14	2.5
Naperville	Du Page River	19.229	1.071	7.55	2.6
Millington	Well (av. of 2 anal's)	20.393	5.995	8.01	2.8
Van Orin	Well	24.383	0.700	9.58	3.3
Shabbona	Well	26.208	1.056	10.29	3.6
Paw-Paw	Well	28.851	10.788	11.33	3.9
Downer's Gr've	Well (very little used)	57.483	7.536	22.58	7.9
Average including Downer's Grove		18.363	3.076	7.21	2.5
Average excluding Downer's Grove		16.405	2.853	6.44	2.2

II. ST. LOUIS DIVISION.

Watering Stations.	Source.	Incrusting solids. Grains per gal	Non-incrusting solids. Grains per gal	Number of lbs. incrusting solids per standard tank of 2,750 gals.	Comparison with Lake Michigan as unity
Rock Island	Mississippi River	4.898	1.458	1.92	0.7
Whitehall	Artificial reservoir	7.289	0.641	2.86	1.0
East St. Louis	Mississippi River	7.930	1.166	3.11	1.1
Rock Bridge	Macoupin Creek	8.046	0.991	3.16	1.1
Merritt	Artificial reservoir	8.806	0.933	3.46	1.2
Table Grove	Tilewell (av. of 2 anal's)	10.117	1.166	3.97	1.4
Roseville	North Nigger Creek (av. 3 anal's.)	10.982	2.8[illegible]9	4.31	1.5
Opheim	Edwards River	11.139	2.041	4.38	1.5
Bushwell	Tilewell (av. 2 anal's)	11.330	3.151	4.45	1.5
Upper Alton	Woods River	12.187	1.108	4.79	1.7
Denrock	Well	13.634	1.956	5.36	1.8
Monmouth	Artificial Pond (av. 2 anal's	13.640	1.612	5.36	1.8
Beardstown	Illinois River	13.880	1.749	5.45	1.9
Rio	Small dam in a slough	14.228	1.341	5.[illegible]9	1.9
Barstow	Well (av. of 2 ana'ls.)	15.558	2.258	6.11	2.1
Bader's	Spring	20.178	2.449	7.93	2.8
Average		11.490	1.678	4.51	1.6

Explanations.—Standard of comparison for both divisions is the water of Lake Michigan.

The incrusting solids consist of the sum of the scale-forming ingredients contained in each water, viz., silica, oxide of iron and alumina, carbonates of lime and magnesia, and the sulphates of lime and magnesia. The non-incrusting solids are chiefly the alkalies.

The number of pounds incrusting solids per the C., B. & Q. standard locomotive tank is obtained by multiplying the number of grains per gallon of incrusting solids by 2,750 gallons, and dividing the product by 7,000 grains, or, which is shorter, multiplying the number of grains per gallon of incrusting solids by 0.393.

The number of pounds incrusting solids of each water divided by 2.87 gives the comparison with Lake Michigan.

As stated, the results given are comparative among themselves and with our standard, Lake Michigan water. Our standard, formerly, was Mississippi River water, but some time ago I decided to make it that of Lake Michigan. My reasons for the change are as follows:

1*st. Constancy of Composition.*—It is evident that a standard should be as little liable to change as possible. A large body of water, with little progressive motion, is less likely to vary than a river flowing a long distance through different geological formations. The river is also subject to high and low water in the various seasons of the year, to high and low tides at certain points, and to other causes of disturbance, which bring more or less suspended matter into the water, all of which is much less true of an inland body of water like Lake Michigan. It is perhaps possible that the northern and southern extremities of the lake might show some slight difference in composition, but not nearly so much as would the Mississippi at varying points of supply; further, as the south or Chicago end of the lake is the chief source of its supply, it renders needless any discussion of such possible variation.

2*d. Amount Supplied.*—Lake Michigan probably supplies more locomotive boilers than any other single source in this country; hence its character, action upon boilers, etc., is better known than that of the Mississippi River water.

The C. & N. W. Railway has also adopted the lake water as its standard, and it is to be hoped that the C. M. & St. P. R. R. Co. (which has a chemical laboratory) and all the other railroads running out of Chicago will do the same, whereby a means of comparison of the locomotive boiler waters of the Northwest country will be achieved.

As regards other waters, that of Laks Michigan ranks fairly well. Of course, being situated in a limestone region (the southern end, at least), its water can not be expected to be quite as pure as the waters of a granitic country, as Scotland or our own mountainous regions, or even the more northerly sections of Wisconsin or Minnesota; for while lime and magnesia salts (which are the chief ingredients of incrustation) dissolve fairly readily in water, silica and silicates do not. The following comparison is, then, of interest:

	Incrusting solids.	Grains non-incrusting solids.	Lbs. incrusting matter.	Comparison.
Lake Michigan	7.3052	0.6260	2.87	1.0
Hudson River	7.177	1.136	2.82	1.0
Croton River (N. Y.)	5.362	1.511	2.11	0.7
Loch Katrine, Scotland	0.911	1.333	0.36	0.1

The character of some of the waters supplied to a number of the chief cities of this country and Europe is shown below, the figures being the total solids (or incrusting and non-incrusting solids) per gallon:

Brooklyn, Ridgewood water	3.92
Boston, Cochituate	3.11
Philadelphia, Delaware River	3.48
Syracuse, reservoir	13.93
Cleveland, Lake Erie	6.27
Rochester, Genesee River	13.25
Jersey City, Passaic River	7.44
London, the Thames	16.38
Dublin, Lough Vartry	3.11
Paris, Seine	8.83
Amsterdam, River Vecht	16.58

To make a comparison between any of the above and any one of the "Q" waters, add together the number of grains of incrusting to the grains non-incrusting solids in the tables given to get the total solids.

To return to the C., B. & Q. waters. On the Chicago division, those on the list from Chicago to Rock Falls may be considered as *good*; those from Rock Falls to Van Orin as *fair*; those from Van Orin to Downer's Grove as *poor*, and Downer's Grove as *very bad*.

On the St. Louis Division, all but Bader's are good, and it is fair, so that altogether the waters of this division are better than those of the Chicago Division, as shown by the average comparison figures of 1.6 and 2.5.

Fuel Energy Utilized by a Locomotive.

In a paper read before an engineering society in St. Paul, Minn., on the "Economical Generation of Steam Power," by Mr. F. T. Hampton, the following statement was made: "For the best non-condensing engines we would realize 6 per cent. for *ordinary* non-condensing engines, such as are found in the average factory, about 3 per cent., and when the boiler is inefficient and the attendance careless, no doubt not more than 2 per cent. of the total heat units in the coal are utilized in actual work."

This statement is apt to strike many people as an exaggerated description of the wasteful conditions ordinary steam engines are worked under, yet a little calculation will indicate that the figures are substantially correct. Let us examine the performance of a passenger locomotive which is reputed to be one of the most economical non-condensing throttling steam engines. A locomotive that will take ten heavy passenger cars over a fairly level road at an average speed of 30 miles an hour, with a coal consumption of 35 miles to the ton, will be regarded as doing fair work on well-managed roads, and it will be far above the average performance on roads where the locomotives are not well looked after.

One pound of the common run of coal used by railroad companies contains about 12,000 heat units when burned with the full admixture of oxygen, each unit being the amount of heat capable of raising the temperature of 1 pound of water 1 degree Fah. When converted into work, each heat unit is equivalent to 772 foot pounds, or possesses the energy, when no waste takes place, of raising 772 pounds one foot. At this rate each pound of coal represents $12{,}000 \times 772 = 926{,}400$ foot pounds of work, were it possible to utilize the whole potential energy reposing in the coal.

A train of ten passenger cars, loaded, and an engine and tender in working order weigh about 360 tons. Careful experiments have shown that a train of this character can be moved at a speed of 30 miles an hour on good level track, on a power expenditure of 7.5 pounds to the ton. This will represent a constant force of 2,700 pounds, which, being extended over one mile, or 5,280 feet, represents 14,256,000 foot pounds as the work done in moving the train over each mile run. The effort exerted by the locomotive amounts to 216 horse-power.

Taking 2,000 pounds as a ton of coal, it will be found to aggregate what looks as the enormous sum of 18,528,000,000 foot pounds, which, if used without loss would move our train close on 1,300 miles. As the locomotive only takes the train 35 miles with the quantity of coal named, it will be found that the energy of the coal converted into useful work is only about $2\frac{1}{2}$ per cent. of the quantity used. That is, out of every 100 pounds of coal thrown into the fire-box, nearly $97\frac{1}{2}$ pounds are lost, or are wasted in holding up the other $2\frac{1}{2}$ pounds to do work. It looks as if engineering skill and scientific knowledge might devise means to capture some more of the power that passes away through the smoke-stack, yet on most of our railroads this line of possible saving receives no attention.

THE report of the Scranton (Pa.) Board of Trade for 1886 says that all the pure anthracite coal in the world is contained in 470 square miles of territory in Eastern Pennsylvania, and that the annual product from this region has increased from 174,734 tons in 1830 to 23,437,242 tons in 1880, and 31,623,529 in 1885.

Communications.

Performance of Locomotives.

Editors National Car and Locomotive Builder:

In your issue for November, I notice you speak of the performance of locomotives on the Wabash, St. Louis and Pacific Railway, saying, that on the middle division they have 162 locomotives making an average mileage of 2,901 miles, their average consumption of fuel being 67 pounds per mile, or 29.8 miles to the ton. You speak of 20 engines being equipped with the Barnes extension front and smoke preventing device, and say that these engines have only used 42.7 pounds of coal per mile, or 46.8 miles per ton, and that one of them has used but 29.29 pounds per train mile, or 70.7 miles to the ton. This is, to say the least, a good showing. We have on this road (the Milwaukee, Lake Shore & Western) 71 locomotives, making an average monthly mileage of 3,261. The average consumption of fuel for all these engines is 42 pounds to the mile, or 47.9 miles to the ton. There are fifteen engines on passenger trains equipped with the extended front and draft regulating appliance shown in the NATIONAL CAR AND LOCOMOTIVE BUILDER of February last. The records for the month of September show that these engines have made an average of 65.4 miles to the ton of coal, or an average of 30.12 pounds to the mile. Five of these have run on an average of 69.02 miles per ton, or 28.9 pounds per mile, and one of them has hauled an average train of five cars with 22.8 pounds per mile, or 87.9 miles to the ton. The engines in all cases have been worked to their utmost capacity.

JOHN HICKEY, M. M.,
Milwaukee, Lake Shore & Western Ry.

Wear of Brake Shoes.

Editors National Car and Locomotive Builder:

I notice the following paragraph in your November number:

"We have heard the assertion publicly made that passenger cars cost about 15 cents for brake shoes for every thousand miles run."

Now, as the brake shoe is used for stopping and not for running the train, I think that the number of miles which the train runs has nothing to do with the matter. One train may stop once in a hundred miles, while another may stop any number of times in the same distance. The speed of a train, weight of cars, etc., would also make quite a difference in the wear of shoes. I send you the following, which is an average of five cars running in different trains:

Speed of train, about 30 miles an hour. Weight of car, 44,000 pounds. Eight brake shoes, weighing 176 pounds when put on, less 36 pounds when taken off "worn out"—say, $3.24. The number of stops made was 1,648, which would be a trifle above two miles per stop. D. W. H.

Varnishing Passenger Cars.

Editors National Car and Locomotive Builder:

I have tried the plan of varnishing two cars in one day. One of them was varnished in the morning, finishing at 11 o'clock, the other in the afternoon, finishing at 5 o'clock. Bigelow's wearing car finishing varnish was used on both. On going to the shop next morning, I noticed that the car which was varnished in the forenoon had a fine luster, and the other one a smoky or cloudy appearance; hence the advantage of varnishing in the morning.

R. E. DALY,
Master Painter M. & O. R. R.,
Whistler, Ala.

Changing Draw-Bars.

Inspector, St. Louis, writes us: "I have had several disputes on account of accepting cars that had strange drawheads put in to replace heads broken. I hold that the Master Car-Builders' rules say nothing about refusing cars that have strange draw-bars. What is your opinion?"

[Our opinion is that Inspector is wrong. Although the rules of interchange of cars say nothing definite against putting in foreign draw-bars, they say that cars shall be repaired to conform with the original design and of the same form and quality of material originally employed.—ED. N. C. & L. B.]

The Work of Pulling Heavy Passenger Trains.

The leading railroads running westward from Chicago appear to be handling trains that have reached the capacity of the ordinary eight-wheel locomotive. We recently traveled on a passenger train on the C., B & Q. that consisted of 5 sleepers, 1 dining car, 1 chair car, 2 day cars, 2 baggage cars and 2 mail cars, 13 cars in all. Most of the cars were very heavy, several of them having eight-wheel trucks. With passengers, mail, baggage and express, the train was estimated to weigh 390 tons exclusive of engine and tender, which would weigh 70 tons more, making a total load of 460 tons for the locomotive to keep in motion. A run of 207 miles was made in eight hours, and during that time fourteen stops were made at stations and five or six stops for crossings. This required an average running speed of 30 miles an hour to be maintained. As the engine was long in getting the heavy train into speed after a stop, and as ascending even moderate grades reduced the speed materially, advantage had to be taken of every easy piece of track, and there the speed would be run up to 45 or 50 miles an hour. The laborious way that a train of this kind is taken over the road on time may be understood from the following notes of the time taken to work the train into speed after stopping at a station on a fairly level stretch of country. The first mile post was about a quarter of a mile from the station.

	Minutes.	Seconds.
Time between 1 and 2 mile posts	3	02
" " 2 " 3 " "	2	35
" " 3 " 4 " "	2	27
" " 4 " 5 " "	2	15
" " 5 " 6 " "	2	01
" " 6 " 7 " "	1	48
" " 7 " 8 " "	1	40
" " 8 " 9 " "	2	00
" " 9 " 10 " "	1	56
" " 10 " 11 " "	1	30
" " 11 " 12 " "	1	27

The engine was getting the train going pretty well when the last mentioned mile was run, having reached a speed of 41 miles an hour, but the advantage of raising the train into speed gained in the preceding eleven miles was then lost by having to stop at a station, and the laborious process had to be repeated. To keep a train of this weight going at 30 miles an hour, an expenditure of engine power amounting to 7.5 pounds per ton is necessary. The engine pulling this train had cylinders 18 × 24 inches and driving wheels 69 inches diameter. To maintain the speed mentioned on the train would require 460 × 7.5 = 3,450 pounds of tractive force to be constantly exerted. At 147 revolutions per minute, which this locomotive would have to make to run 30 miles an hour, there would be no difficulty while cutting off at 6 inches, in having a mean effective pressure in the cylinders of 40 pounds. This would enable the engine to exert a tractive force of 4,508 pounds, which it might be supposed ought to have kept the train running and have power to spare. It did not do so, however. To keep time, the engine had to be run with the steam cutting off at nine inches, and then there was no power to spare.

The natural inference on noting these facts and making the calculations would be, that more resistances than 7.5 pounds per ton had to be overcome in keeping a train running at the rate of 30 miles an hour, but nothing about the business had been more clearly demonstrated than the fact that 75 pounds covered the resistance for the speed named. The engine working steam at nine inches cut, would maintain in the cylinders steam of at least 75 pounds M. E. P. This would produce an average tractive force of 8,452 pounds, considerably more than double the power that would be necessary to handle the train if it had merely to be kept going at a uniform speed.

Those who have had experience with trains that have to be forced rapidly from a state of rest to a speed of 30 or 40 miles an hour, would readily perceive that the great additional power used by the engine pulling the train under notice, was put to the work of lifting the train into speed after each stop. The great weight of the train also required the exertion of great extra power to prevent even a light grade from reducing the speed.

This may be regarded as a representative passenger train of our Western railroads, although trains are seldom found so heavy. But the conditions under which the ordinary train is moved are very much like the process described. The locomotive starts from a station, gradually accelerating the motion of the train, and the maximum speed is just reached when it is time to shut off steam and stop at a station or crossing. By this means two or three times the power has to be exerted to run a train that would be needed if stops did not occur more than every fifty miles, instead of every five or ten miles as is now the rule.

Chair Cars.

The Chicago, Alton & St. Louis Railroad has always been one of the most popular lines running into Chicago, and the company still maintain the prestige which has no doubt been deserved. They are said to have been the first company to introduce dining cars, and on this road sleeping cars first became popular. These accommodations were looked upon as innovations that no sensible railroad should imitate, but very soon all competing lines found it desirable to introduce dining and sleeping cars or lose public patronage. The Chicago, Alton & St. Louis company are again taking the lead in another innovation. They are using chair cars for all their ordinary day coaches, the travelers paying no extra charge for the superior accommodation. Chair cars take a little more room per passenger than an ordinary seat, but when they are in use there is less friction in filling every seat in a car. With ordinary double seats there is always annoyance in getting the whole seat filled with two passengers when the car is crowded, for many people consider themselves aggrieved if they cannot have each a whole seat, and they act rudely toward the unfortunate who requests to share a double seat in preference to standing beside the coal box. But when chair cars are used there is no temptation for travelers away from their natural surroundings to exhibit their hoggishness. Several other roads are adopting the chair car for ordinary day travel, among them being the Union Pacific, which have put on chair cars on the trains running between Omaha and Beatrice. Various kinds of chairs are used, nearly all of them being much more comfortable than the double seat. The Scarritt reclining chair is coming rapidly into popular use and is highly spoken of for comfort.

Master Car-Builders' Association.

The Secretary, Mr. M. N. Forney, has issued the following list of subjects, with the committees appointed to report thereon at the annual convention of the Master Car-Builders' Association to be held in Minneapolis, June 14, 1887:

1. *Standards and Appliances for the Safety of Trainmen:*

In 1884, the committee on this subject was appointed in accordance with the following resolution: "*Resolved*, That a committee be appointed to prepare a circuler calling the attention of railroad managers to the standards and the appliances for the safety of trainmen, which have been recommended by this association, and that this committee be urged to do everything in its power to secure their adoption." At the convention held in 1885, the committee was discharged, and a resolution was passed to have a new one appointed. This committee was continued in 1886.

H. Hegewisch, United States Rolling Power Co., No. 35 Wall street, New York.
John Kirby, Lake Shore & Michigan Southern, Cleveland, O.
M. N. Forney, No. 23 Murray street, New York.

2. *British and Continental Practice in Matters of Interest to the Master Car-Builders' Association:*

R. H. Soule, New York, Lake Erie & Western, Buffalo, N. Y.
Wm. McWood, Grand Trunk, Montreal, Can.
Henry A. Whitney, Intercolonial, Moncton, N. B.

3. *Automatic Freight Car Brakes:*

Godfrey W. Rhodes, Chicago, Burlington & Quincy, Aurora, Ill.
Geo. Hackney, Atchison, Topeka & Santa Fe, Topeka, Kan.
B. Welch, Central Pacific, Sacramento, Cal.
John S. Lentz, Pennsylvania & New York Canal & Railroad Co., Packerton, Pa.
W. T. Hildrup, Harrisburg Car Co., Harrisburg, Pa.

4. *The Comparative Advantages of the Two Methods of Constructing Freight Cars, with and without Platform Timbers or End Sills projecting from the End of the Car:*

This committee was continued, its scope enlarged and it was empowered to submit plans giving two standards for the end floor framing of freight cars.

E. B. Wall, Pittsburgh, Cincinnati & St. Louis, Columbus, Ohio.
B. K. Verbryck, Chicago, Rock Island & Pacific, Chicago, Ill.
Geo. W. Cushing, Northern Pacific, St. Paul, Minn.
W. H. Harrison, Baltimore & Ohio, Baltimore, Md.
W. F. Turreff, Cleveland, Col., Cin. & Ind., Cleveland, O.

5. *Maximum Outside Dimensions of Freight Cars:*

John P. Levan, Pennsylvania Railroad, Altoona, Pa.
C. A. Smith, Union Tank Line, 267 Fourth street, Jersey City N. J.
Geo. C. Watrous, Detroit, Lansing & Northern Railroad, Ionia, Mich.

6. *Standard Draw-Gear for Non-Automatic Couplers:*

S. B. Haupt, Norfolk & Western Railroad, Roanoke, Va.
J. N. Mileham, New York, Lake Erie & Western, 234 Third street, Jersey City, N. J.
Allen Cooke, Chicago & Eastern Illinois, Danville, Ill.

7. *Appliances to Prevent the Slipping of Wheels, both Passenger and Freight:*

J. W. Marden, Fitchburg Railroad, Boston, Mass.
F. M. Wallis, Philadelphia, Wilmington & Baltimore, Philadelphia, Pa.
W. H. Day, Wilmington, Columbia & Augusta Railroad, Florence, S. C.

8. *Standard Freight Car Truck and Axle for Cars of* 60,000 *lbs. Capacity:*

This committee is instructed to suggest means for having the axles made uniform in size.

Joseph Wood, Pennsylvania Company, Fort Wayne, Ind.
H. Roberts, Grand Trunk and Detroit, Grand Haven & Milwaukee, Detroit, Mich.
M. M. Martin, Wabash, St. Louis & Pacific, Decatur, Ill.
Leander Garey, Hartsdale, Westchester Co., N. Y.
R. C. Blackall, Delaware & Hudson Canal Co., Albany, N. Y.

9. *Standard Sizes of Lumber for Freight Cars:*

Wm. Forsyth, Chicago, Burlington & Quincy Railroad, Aurora, Ill.
Frank J. Hecker, Peninsular Car Works, Detroit, Mich.
W. R. Davenport, Erie Car Works, Erie, Pa.

10. *The Best Form and Construction of Car Roofs:*

J. D. McIlwain, Grand Trunk Railway (Great Western Division), London, Ont.
Samuel Irwin, Missouri Pacific, Sedalia, Mo.
L. Packard, New York Central & Hudson River, West Albany, N. Y.

11. *Subjects to be Reported at the Next Annual Convention for Investigation and Discussion at the Succeeding Convention:*

J. W. Marden, Fitchburg Railroad, Boston, Mass.
John W. Cloud, Pennsylvania Railroad, Altoona, Pa.
Thomas A. Bissell, New York Central Sleeping Car Co., Buffalo, N. Y.

12. *Committee of Arrangements for the Next Annual Convention:*

Geo. W. Cushing, Northern Pacific Railroad, St. Paul, Minn.
Geo. F. Wilson, Minneapolis & St. Louis Railroad, Minneapolis, Minnesota.

WE are gratified to notice that the Old Colony Railroad Company have been giving a good example to the railroads in New England by leading in the work of abolishing grade and highway crossings. During last year, says the annual report, "four highway crossings in Hingham have been discontinued. Two highway crossings in Middleboro have been avoided by the construction of a new highway. Three highway crossings in Kingston and Plympton have been carried over the road by two overhead bridges, and two crossings in Leominster have been replaced by a single highway, protected by gates. The cost of these improvements, by which the number of level crossings of the track has been diminished by 10, has been $11,469.52, with some claims remaining unsettled. Probably no expenditure can be made upon the road more profitable for the company than in the abolishment of these grade crossings. There are several others upon which the work has been commenced of substituting overhead bridges for level crossings."

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock, construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

Interchange of Cars.

The labors of the Master Car-Builders' Association have had a most beneficial educational effect upon railroad men in making them acquainted with the conditions under which it is safe to run rolling stock; but recent discussions would seem to indicate that there is still urgent need for the dissemination of information about the rules that most railroad companies have agreed to be guided by in the interchange of cars. The rules in question have been framed for the purpose of doing justice between railroad and railroad. They have been designed to prevent disputes and misunderstandings between railroad companies doing business with each other, to facilitate the movement of cars and to preserve life and property. When a railroad company follows the policy of maintaining the rolling stock in good, safe running order, the officers in charge can not be expected to risk a wreck or accident by accepting from a connecting road a car in a dilapidated or dangerous condition, and great care has been exercised in settling the rules of interchange of cars to define distinctly when a car is not in good running order. So far from appreciating the value of the rules of interchange of cars have been some railroad officers, that they have expressed the opinion that the rules retard instead of facilitate traffic; but where sentiments of this kind prevail, it may be concluded that the parties are ignorant of what the rules really are, or that they have no desire to do as they would be done by. The crying need on this subject is for railroad men to supply themselves with copies of the rules of interchange of cars, and read them carefully. That the rules will then be understood goes without saying.

The ignorance or carelessness of many men in charge of car construction as to proper wheel gauge is the cause of many wrecks. In speaking, at the Western Railway Club, on the gauge of wheels, Mr. L. E. Johnson said: "It has been demonstrated practically on the Chicago, Burlington & Quincy, that the limit (4 ft. 5 in. to 4 ft. 5½ in.) are the only ones that can be considered absolutely safe, and that in accepting cars under or over these limits we assume the liability of wrecks." These words, and the remarks of other speakers, indicated that the men who understand car construction and the conditions under which cars are run, were thoroughly impressed with the necessity for adhering closely to the established gauge, yet so many of the cars offered for interchange are out of the prescribed limit that a number of roads running into Chicago have been induced, much against their will, to agree to deviate from the gauge for a time, to prevent wholesale delay in the movement of cars. In the course of the discussion it was mentioned that new cars were being built with the wheels 4 feet 6 inches between flanges. Wheels in this condition are dangerous to life and property, and the offering of the cars for interchange is equivalent to requesting a road to put its trains and trainmen in serious jeopardy. If the men who are responsible for accepting cars of this kind from builders were properly conversant with the rules under which their cars would be accepted or rejected by connecting roads self-interest would surely induce them to insist on the wheels being put on to the proper gauge. That accidents are common where cars are running with the wheels out of gauge, is a matter of no surprise, the astonishing thing is, that wheels 4 feet 6 inches wide between flanges run for ten miles without leading the train into the ditch. No wonder that frogs are hammered to pieces and flanges dangerously chipped.

The open and covert opposition which the spirit of the rules of interchange meets on some roads, and the ignorance of the rules displayed by other roads, are forcibly illustrated by the letters from Mr. Clarke, Superintendent of the Minneapolis & St. Paul Railway, read at the last meeting of the Western Railway Club. Mr. Wilson, Master Car-Builder of the road named, found it necessary to issue orders to the car inspectors requiring them to enforce the very important portion of the rules of interchange respecting defective ladders, ladder-rounds, hand-holds and running-boards. To send cars on the road with these parts defective is an act of potential homicide, yet a connecting road thought it "better for a railroad company to assume the risks rather than the trouble it would give to enforce such a rule." It is to be hoped for the cause of humanity that there are not many railroad officers ready in cold blood to advocate the use of death traps rather than incur the delay necessary to put cars in safe running order.

The other case mentioned is typical of a wide-spread trouble that is intensified by ignorance of the rules of interchange. The C. & D. road delivers to the M. & St. L. road a car with foreign draw-bars. The owners of the car refuse to accept their car in that condition, and when the C. & D. road men are asked what they are going to do about it, they protest that the Master Car-Builders' rules do not require them to know that the car had foreign draw-bars. This is the case of a "little knowledge being a dangerous thing." The C. & D. road people knew that the Master Car-Builders' Association had framed some rules for regulating the interchange of cars, but they did not know, or ignored the fact, that these rules required all repairs made on cars on a foreign road to conform to the original construction of the car, unless the owner and the road making the repairs agreed otherwise. When cars are repaired with strange material or parts, as is often done to save time, a defect card must be placed upon the car, which insures its acceptance by connecting roads. The interpretation put on the rules of interchange by the C. & D. road would lead to no end of confusion, for if connecting roads were not supposed to know the draw-bars that belonged to a car, neither might they know the trucks or other attachments, so that cars which had made a protracted journey might come back to the owner with nothing left of the original except the body, and yet be in "good running order."

Heating Cars with Steam from the Locomotive.

The lamentable accident at Rio, on the Chicago, Milwaukee & St. Paul Railroad, has again roused up an agitation in favor of safer methods of car heating than the primitive stove affords; and the substitute recommended by many writers is steam from the locomotive. Increased attention has been directed to this method of car heating, owing to its being followed on the Elevated Railroads of New York, yet even there the system is not an unqualified success, for every winter the steam-heated cars is the theme of complaint by the people accustomed to riding on the roads, but when a smash-up occurs on a surface railroad, and a number of unfortunate people get roasted to death, by stoves setting fire to the inflammable material used in building the cars, all the deficiencies of steam-heating are forgotten, and the traveling world with one voice exclaims, Why are all railroad cars not heated with steam from the locomotive? The system that previously bristled with imperfections and shortcomings suddenly becomes for the time being the highest ideal of perfection. To the average passenger, who does not really comprehend any thing about the difficulties of car heating, but is affected by the spirit of the period, it seems incomprehensible that railroad companies should continue to cumber their cars with unsightly dangerous stoves and room-obstructing wood or coal-boxes, when all the heating could be done in a cleanly and labor-saving fashion by steam-pipes leading from the locomotive. They know that steam-heating is the most approved method of keeping dwellings and public buildings comfortable in winter, and there seems to be nothing but obstinacy or blind stupidity to prevent railroad companies using the same method for heating cars, especially when they have a locomotive boiler on each train to supply the needed steam. This is the way the question has been discussed since the Rio accident.

The fact is, however, that car heating is not such a simple problem as the average traveler imagines it to be, notwithstanding the fact that elevated and suburban trains are heated by steam from the locomotives. Circumstances alter cases, and a system that works fairly well on a short train that stops at frequent intervals is likely to be found utterly inadequate to the needs of a heavy or fast train, or a train that makes but few stops. Pulling the train along on time is work enough for all the steam generated by ordinary locomotive boilers. The locomotives on the elevated roads of New York that supply steam to warm the cars, and are so often quoted as examples for other roads, are noted for having ample heating suface in the boilers; yet during cold, windy weather, although the stops are numerous, averaging three per mile, the fires have to be forced to generate the required steam. Steam is taken direct from the boiler to heat the cars, the officers of the road being aware that steam can not be taken economically from the exhaust for this purpose. Roads having light trains and good locomotives might have steam to spare to heat the cars during ordinary weather, but the difficulty is, that when heat is most wanted in the cars the locomotive is not likely to have any to spare. With a heavy side wind and the thermometer in the neighborhood of zero, a great deal of heat is needed to keep cars comfortable, for the air inside changes rapidly, and that is the time the locomotive is likely to have full work keeping the train running. In a few isolated instances railroad companies are reported to have asserted that their cars were heated satisfactorily with steam from the locomotive exhaust, and master mechanics have testified in writing that without any closing up of the nozzles their locomotives have supplied steam to heat the cars and continued to work as well as they did when all the exhaust steam passed through the stack. Men who make public statements of this kind would be ashamed of their words if they knew enough about steam engineering to understand how strongly they testified against their own competency. The exhaust steam from the locomotive has never been used economically for any other purpose than creating draft. Attempts have frequently been made to use the exhaust for other purposes, but in the long run it has always been discovered that the loss from back pressure offset any apparent saving.

Because steam heating is an unqualified success in dwellings and other buildings, it does not follow that the method is equally well adapted to railroad trains, even if the locomotives could, by enlarging the boilers, be made to supply the necessary steam. Some of the most valuable peculiarities of ordinary steam-heating systems are not applicable to railroad trains. The water cannot be trapped and returned to the boiler, and great waste of heat is inevitable in keeping up a free circulation in the pipes and radiators. Any failure to keep up the circulation in cold weather is certain to lead to the freezing of pipes, with the liklihood of cutting off the heat from a portion of the train. Constant care and attention are necessary during severe weather, when heat in the cars is most essential to prevent the few pipes about a locomotive from freezing up, and the shortest relapse from vigilance will often lead to the bursting of pipes or serious delay in thawing out. In operating ordinary railroad trains it is often necessary to detach the train from the locomotive or to separate part of the train while work is being done at stations. A long train, heated by steam, would have the connections frozen solid in some situations when the train was changing engines at division points, and there would be so many exposed parts to watch, remote from the source of heat, that they would be far more liable to freeze up than the pipes of a locomotive. Frozen pipes are by no means uncommon on the roads using steam-heating, but the runs are so short that the trouble is little noticed.

Startling Discoveries About the Wear of Locomotive Tires.

The urgent necessity for subjecting alleged improvements of locomotive appliances to accurate and searching tests to ascertain their real value or to discover any shortcomings before they are put into general service, was very forcibly illustrated by the discussion on locomotive tires at the last meeting of the Western Railway Club. The adoption of 4 inches as the standard thickness of locomotive driving-wheel tires has been very common of late, and several roads have got into the practice of ordering nothing smaller. Some few tire makers, and an occasional master mechanic, would be found who doubted the wisdom of increasing the thickness of tires 33 per cent. at one jump, but these doubtings were nearly always regarded as conservative notions with little more than prejudice to support them. There appeared to be very good reasons for the belief that a 4-inch tire would give a much higher percentage of wear than a 3-inch tire before removal was necessary.

Rolling a tire is not a complex or difficult process, and it was hard to see how a tire 4 inches thick should not be rolled as sound, compact, and consequently as durable as a 3-inch tire, especially when there was understood to be no difficulty in preparing blooms with stock enough for the larger tire and to spare. Men naturally reasoned that as a 3-inch tire had to be removed when it got worn to 1½ inch, giving only 50 per cent. wear, it would be a decided advantage to increase the size to 4 inches and obtain 66 per per cent. of wear. There was also some impression that driving wheels with a heavy 4 inch tire made an engine run steadier than when lighter tires were employed, the heavier revolving mass serving to absorb some of the disturbances due to inaccurately balanced reciprocating parts. For these reasons thick driving wheel tires were becoming popular.

When it was determined to discuss the subject of "locomotive tire section" at the Western Railway Club, Mr. G. W. Rhodes decided with praiseworthy enterprise to collect data about the wear of different thicknesses of tires and report the same to the club. The report he presented, which will be found in the proceedings of the club, astonished every railroad man present, and the information ob-

tained by the investigations he made surprised Mr. Rhodes as much as any one. The C. B. & Q. railroad company have used enough 4-inch tires to enable them to make a fair comparison of the relative wear of 3-inch and 4-inch tires. The statistics collected from locomotives of similar weight and dimensions doing similar work, indicated that the engines having tires 4 inches thick made a much smaller mileage per 1/16 inch wear than those having tires 3 inches thick. The difference was so great that the 4-inch tires only made for their whole life an average running service of 2,000 miles beyond that made by the 3-inch tires. When the fact is remembered that the 3-inch tires yielded over 4,000 miles of running service for every 1/16 inch wear, the significance of the inferior work done by the thicker tire becomes apparent. The figures in the statement are so conclusively against the thick tire that most master mechanics will refrain from using it till some guarantee can be given that the extra inch of steel will give better wear than it appears to have been doing.

The table of wear of tires on the Lake Shore & Michigan Southern Railway, submitted by Mr. Gilmore, indicated that the best wear of tires on that road was obtained before the first turning, but that the greatest average wear was after the tire had been turned down about one inch. This would appear to indicate that even with tires thinner than 4 inches the portion nearest the inside was the most compact, and that the thicker the tire was made the more material was there in it that was not of a durable nature. Some western mechanics who have used tires 2½ inches thick to a great extent, believe that a 3-inch tire gives service inferior to the tire ½ inch thinner, and the discoveries about the bad wearing qualities of the 4-inch tire would tend to corroborate their views. The evidence that the inside portion of a tire wears best seems indisputable, yet the conditions under which locomotives are operated ought to subject the portion of the tire nearest the wheel to the greatest amount of sliding friction, which undoubtedly wears tires more rapidly than rolling friction. With a locomotive having a 56-inch wheel center there is considerable difference in the power transmitted from the cylinders to turn the wheels between the time the tire is 4 inches thick and the time it gets worn down to 2 inches. When the stroke is 24 inches the radius of the crank pin path is 7.64, and when the tire is new the radius of the wheel is 32 inches, which comes down to 30 inches when the tire gets worn two inches. When an engine having these proportions with cylinders 18 inches diameter is using steam of 120 pounds, M. E. P., it will be found that about one thousand pounds more power is exerted to turn the small wheels, due to the worn tire, than is exerted to turn the wheels when the tires are new. In many conditions of rail and weight on drivers, this mere use of power means the difference between rolling and slipping. A significant feature of the newly discovered data about the wear of locomotive tires then is, that they wear with extraordinary rapidity at the period when the power transmitted is least likely to cause wear by slipping. The mechanical defects of rolling that produce this result ought to be remedied immediately or railroad companies will be compelled to return to using 2½ and 3-inch tires. The necessity for retrogression of this kind would be discreditable to tire makers.

Uniform Train Rules.

The railway managers and superintendents in their General Time Convention, held lately in New York, transacted business which ought to prove of the greatest importance to railroads in practically agreeing upon a code of general and train rules. The practical men who took the lead in framing and discussing the rules are likely to produce a code applicable to all the railroads in the country, which shall be free from the ambiguity and even contradiction found in the existing train rules of some railroads. To make train rules so plain in language that no two men are likely to interpret their meaning differently is about as difficult an undertaking as the framing of rules of interchange of cars that will lead to no misunderstandings, but we believe the men working out the problem of making the wording of train rules unmistakable will succeed, so far as success is possible. This is a case where the smaller roads will reap the greatest benefit from the labors of the leading railroad men who have undertaken the labor of making train rules uniform. Nearly all large railroads have good train rules already, but there are many small roads run by men not intended by nature for managing more complex operations than ditching, and who often insist on forcing their own personal views into plain rules, thereby putting the meaning beyond ordinary men's comprehension. When it becomes the custom to accept the general rules without interference, the capacity of the imbecile-meddlesome railroad managers to cause disaster will be removed.

The rules that were adopted are said to be different from those in operation on any single road, while at the same time embracing the rules acknowledged to be the best and partly in use by many roads. In addition to obtaining the best rules that the combined wisdom of a multitude of counselors could devise, and select the roads that adopt the standard rules, will avoid the fruitful source of accident now arising from men that have changed from one road to another, mistaking signals because they have different meanings on different roads. The following extract from the committee's report gives forcible reasons why a uniform code of rules should be adopted by all roads understanding their own interests:

"The investigations of your committee have developed the fact that in many States railway commissions have undertaken to criticise and condemn many of the rules in force for the operation of railways, even upon the best-managed lines. The tendency of such commissions, as well as of State legislatures, is in the direction of formulating rules and regulations which shall conform to their ideas of railway management, however these may vary from the best judgment of experienced railway officers. Juries also are prone to construe, to the detriment of railway interests, any assumed weakness in running rules or telegraph instructions. The fact of the existing want of uniformity in rules has been frequently used before juries to show that an accident upon one railway might have been prevented by the use of a rule in force upon some other railway, even though the rule in question has successfully borne the strain and stress of long-continued usage. This, with the growing tendency of railway commissions to condemn any practice to which they attribute the cause of an accident, and their frequent findings that the practice of some other railway, or the adoption of some rule of their own formulation, would, in their opinion, have prevented such an accident, often renders successful defense extremely difficult. These facts impressed upon your committee the grave importance of the work undertaken."

The Burning of Railroad Passengers.

A telescoping collision of passenger cars in the daytime in summer is sufficiently suggestive of suffering and death, coupled as it usually is with neglect, recklessness and mismanagement, but when it is accompanied with a conflagration from broken stoves in the darkness of a winter night, and the roasting of wounded and helpless victims shut in by wooden walls as inflammable as paint and varnish can make them, the horror of the situation is unspeakable. The accidents of this class which have occurred within the past fifteen years, beginning with New Hamburgh on the Hudson in 1871, and ending with the one at Rio, in Wisconsin, four weeks ago, would, if arranged consecutively, form a hideous catalogue. But the end is not yet. The same causes will continue to produce like effects. Open switches, badly arranged signals, misunderstanding or disobedience of orders, running trains on fast schedules, etc., will be the precursors of similar disasters which will go on the record, excite a momentary consternation, and then be lost sight of like other forgotten things.

If these occurrences are, as they seem to be, inseparable from railroad operation, then we might as well accept the inevitable and cease wailing over the decrees of fate. The culpability, if there is any, is not limited to this or that particular road upon which such accidents happen, but should be apportioned over the entire system. A failure to make timely use of certain precautions leads to a crash on one road. The same negligence exists at the same time on a great many other roads, but the same conjuncture of circumstances which makes the crash inevitable only occurs here and there at certain intervals. The forgetful switchman or disobedient engineman, if not too much disabled to do so, makes for woods to escape lynching. The coroner does his duty, the storm of newspaper censure subsides, suits for damages are bought off and the unfortunate road company hopes for better luck next time. There was clearly nothing intentional about it, and to wreak vengeance upon the parties directly at fault by lynching or sending them to prison, would be a sort of vicarious punishment inflicted upon one or two individuals, while a thousand others guilty of a similar neglect escape by sheer good luck.

The means for lessening more effectually the number of collisions and derailments can not be brought into use at once. They are numerous and need not be referred to here. But it does seem that something should be done without further delay to lessen the liability of cars to take fire in such emergencies. The body of an ordinary passenger car, the inside of it especially, is composed of a mass of combustibles, and so long as fire is carried in the inside, at one or both ends, in the form of live coals in a stove or heater of any kind, the car may be in a blaze in an instant after a collision or overturn. No material of which a practical inside fire receptacle can be made, and no method of fastening to the floor are capable of resisting a first-class telescoping crash. What then is to be done to save the struggling victims pinioned among broken seats and timbers from being burned alive? It is clear that if no fire is carried inside the car the inside will not burn, nor the outside either, unless fire comes in contact with it, and in such case it can easily be got at and extinguished. We do not speak of gas-burners or non-explosive lamps, because the instances in which the occupants of cars have been burned to death by fires originating from these fixtures are extremely rare. It is the scattering of live coals that does the mischief.

Did our space permit, we could refer to a great number of methods that have been devised within the past few years for warming cars with live steam from the locomotive, and with steam and hot water supplied from special boilers in the baggage car and circulated through the train in pipes. But after a few "highly satisfactory" trials and glowing newspaper notices, they were no more heard of. In the winter of 1882, an apparatus for utilizing the waste or blow-off steam from the locomotive for warning cars, was tried on the Troy & Boston road with such complete success as regards safety, economy and general effectiveness, that the president and superintendent of the road published a detailed report setting forth that the merits of the apparatus had been satisfactorily demonstrated, and this is the last we have heard of it.

The chief objection to train-heating devices is the pipe connection between the cars and the many inconveniences incidental thereto. This trouble is avoided by warming each car independently, which can only be done by having stoves inside the cars, or by furnaces suspended underneath the car bodies. This latter method has been in use many years on the Philadelphia & Reading, and also on some other roads the names of which we do not remember. It is in our judgment the best and most economical way of warming passenger cars. It makes room for more seats inside, removes the litter of fuel and ashes and inside attendance, and as for safety, it stands to reason that a fire receptacle underneath and outside of a car is far less dangerous than it is inside. This was practically shown by the effective manner in which these suspended heaters were torn from the cars in the derailment of a passenger train of the Reading road, at Greenville, N. J., February, 1885.

Car bodies can doubtless be made to a very considerable extent incombustible by the use of wood saturated with chemical ingredients, especially the wood which is used for inside finish. It is said that timber treated with tungstate of soda will not take fire, and as regards heating, there is a wide field for the devising of methods by which the present liability of cars to take fire may be greatly diminished. But such is the apparent indifference of the public, and especially railroad passengers, to the perils of traveling, that a dozen Angola and Spuyten Duyvil disasters in a single year would probably not bring about any immediate revolution either in the material of construction or in the prevailing methods of warming cars. The great majority of people will remain content to take the chances with the comfortable stoves to which they have been so long accustomed; and as for any incombustible inside finish, they will doubtless continue to prefer the elegant tinder-box cabinet work and varnished surfaces which ignite about as readily as dry shavings.

Committee Circulars of the Master Mechanics' Association.

The committees appointed to investigate the various subjects to be discussed at the next Master Mechanics' Convention appear to be unusually zealous, for several circulars of inquiry have been out for weeks, and we publish three new ones on another page. Messrs. Griffith, Graham and Mackenzie are calling for information relating to locomotive tires, a subject that is of great importance to every road. Mr. R. H. Briggs is requesting information about traction increasers, a subject that bears close relation to the previous subject. The data bearing on this subject is rather limited, and therefore those having any experience with traction increasers should not fail to give Mr. Briggs, and through him the whole railroad world, the benefit of what they have learned. Messrs. Schlacks, Cooke and Stokes call for information on piston rod, valve stem and steam cylinder packing. This committee appears to be unusually earnest and determined to find out all that is known about the subjects they have under investigation, for they have sent out no fewer than twenty-four questions to be answered, most of them being directly to the point.

The success of each annual convention depends to a great extent upon the character and value of the reports submitted by the various committees. The reports in their turn are very much what the members at large make them by the way information is furnished in reply to the circulars. In view of this we would earnestly urge all master mechanics to answer the circulars and tell what they know about each subject. Do not stow the circulars away in the pigeon-holes to be forgotten. Keep them in hand till they are answered. There are very few master mechanics who cannot add something that will be of value to his associates. We would in particular call the attention of young members to the importance of answering the circulars. They will find that writing what they know about the various subjects brought up, will have a wonderfully good effect in sharpening their perceptive faculties.

Water for Locomotive Boilers.

On another page we publish a report on "The Character of the Boiler Water on the Chicago & St. Louis Divisions of the Chicago, Burlington & Quincy Railroad," with remarks thereon by Mr. W. L. Brown, who is in charge of the company's laboratory at Aurora. There is also a description of the method of comparing the various wells with the standard, which is the water of Lake Michigan,

This report and the method of comparison followed are well worthy of earnest study by those in charge of the water supply of railroads located in the-lime rock regions of the country, for they suggest a very easy and simple method of showing the relative value of different water stations. The quantity of incrusting solids present in solution in water varies very materially in wells not far apart, and it is sometimes of great importance that easy means should be provided for distinguishing the good from the bad water. The method followed in the table, of showing the number of pounds of solid matter contained in each tankful taken from the various water stations, is one that will appeal strongly to every intelligent engineer who objects to having his boiler filled up with mud and scale.

In many districts the scale-forming ingredients in the feed-water seriously reduce the net earnings of railroad companies. When the loss due to increase of fuel consumption caused by scaled heating surfaces and leaky fire-boxes and flues is added to the cost of boiler repairs, it is found that hard boiler water doubles the cost of repairs for locomotives. After having tried numerous methods of purifying feed-water, or of manipulating it in tanks or boilers, so as to prevent incrustation of the heating surfaces, railroad companies have generally come to the conclusion that selection of soft water was the only practicable remedy for incrustation troubles. Of late years great expense has been incurred on reservoirs to hold surface water, and on conduits to bring soft water from distant points; but a season like the past summer, with its long-continued drouth, upsets the best-laid schemes and throws the water supply back upon the hard wells. When a road is by this means thrown back upon the use of well water of such variety of hardness as that shown in the report, and which is excellent water throughout, compared to what is found in some districts, it is a wise plan to provide the means of distinguishing plainly between the good and the bad stations.

The New Standards Adopted by the Master Car-Builders' Association.

As will be seen by the announcement and illustrations on another page, the Car-Builders' Association have adopted four new standards by the prescribed letter-ballot vote of two-thirds, making nine standards in all which have been adopted since its reorganization in 1882, counting the limit gauge between wheel flanges and limit of variation therefrom as one standard instead of two.

This is making progress, which contrasts favorably with the dilatory action during previous years. It should be noted that these several standards have not only been adopted by a full vote of the membership, or nearly so, the total vote in each of the ten ballots ranging from 279 to 502, but that the excess over the requisite two-thirds has been so large in most of the ballots as to make it unlikely that any of these standards will very soon be changed or modified, unless some obvious and urgent necessity shall seem to require it. They have been adopted after prolonged discussion and full deliberation, and any action of the association tending to unsettle what has been done would shake confidence in the stability of existing standards, as well as in the wisdom of trying to establish additional ones in future.

It is one thing for the association to adopt and recommend, and another thing for the railroad companies to make their practice conform to what is recommended instead of adhering to their own local standards. The outlook in this respect is not as promising as might be wished. The attempt to change the height of passenger car draw-bars, although it has been decisively voted down, shows a tendency to depart from standards adopted by the association; and all railroad men know how it is with the standard axle, journal-box and bearings. There is a disposition in certain quarters to ignore the standard distance between wheel flanges in the construction of new cars, and it remains to be seen how it will be with the new dead-block, wheel tread and brake-shoe standards just adopted.

The decision in regard to the proposed standard freight car truck for cars of 40,000 lbs. capacity, submitted to letter-ballot at the June meeting of the association, has not yet been announced.

THE letter of Mr. John Hickey, master mechanic of the Milwaukee, West Shore & Western road, which we publish elsewhere, is deserving of more than a passing attention from the class of railroad men who are laboring to operate their locomotives with the least possible consumption of coal. The performance of locomotives on the Wabash, St. Louis & Pacific, referred to, was of a kind that any master mechanic has good reason to be proud of, yet the engines on the Milwaukee, Lake Shore & Western, equipped with an extension front, exhaust pipe and smoke-stack combination adjusted to make the engines steam with the largest possible exhaust opening, excelled the work done by the locomotives on the Wabash. They ran during the month of September, doing their ordinary work on a coal consumption of 30.12 pounds to the train mile. This is not done on a level road with light trains, for the Milwaukee, Lake Shore & Western is quite hilly. There is in operation 584 miles of road, and in this there are nineteen grades that range from 6,000 to 8,000 feet in length, and rise from 1 to 1.2 per cent.; and five grades over 15,000 feet long that rise over 1 per cent. When remarkably low consumption of coal per train mile can be shown on this road, results approaching the same figures ought to be possible on nearly all roads.

THE next annual convention of the Railway Master Mechanics' Association will be held at St. Paul, Minn., beginning June 21, 1887; and the next convention of the Master Car-Builders' Association will be held at Minneapolis, one week earlier.

Locomotive Engineers' Convention.

The Brotherhood of Locomotive Engineers held their twenty-third annual convention at New York, beginning Oct. 20. The representatives of the Brotherhood received a very hearty welcome to New York, many of the leading citizens being present at the opening meeting. Grand Chief P. M. Arthur was elected the fifth time for three years, the usual term, and the other officers were elected for one year. In his annual address Grand Chief Arthur made an eloquent and earnest plea in behalf of the Insurance, soliciting greater and more hearty support for that institution than it had hitherto received from the great mass of the members. During the past year the Brotherhood has established twenty-eight new divisions, making the total membership of the order nearly twenty thousand. During the last year the Grand Chief had been summoned to aid in adjusting grievances between the engineers and officers of ten different railroads, and in every instance a satisfactory adjustment had been made.

An important change was made in the rules of the insurance connected with the Brotherhood, permitting a member to take out a policy for $1,500, or half the sum of the usual policies. At the close of the last fiscal year this institution had 4,444 members. During the year 77 claims were paid, which indicated the high percentage of mortality due to the hazardous calling of the members.

Mineral Wool.

This substance, which is a product of the blast furnace, is an unequaled non-conductor of heat and entirely incombustible. These qualities make it extremely useful in a variety of ways in which the waste of heat and danger of fire are to be avoided. In fact, there is hardly any limit to the extent to which it may be usefully applied. No other material is so well adapted to prevent condensation of steam in boilers, cylinders and pipes, the passage of heat through roofs, partitions and side walls, deaden sound, and check the inroads of vermin and the spread of fire. It is also of great service in preventing water in mains and feed-pipes from freezing, ice in refrigerators and ice-houses from melting, and as an insulator in cold-storage houses and breweries. It is also used to a considerable extent for lining the floors of passenger cars. The practice has long prevailed of filling the spaces between the false floor and the floor proper with shavings or sawdust as a "deadener," although mineral wool is just as good for this purpose, besides being fire-proof and a non-conductor. The sides and ends of a car also need protection as much as the floor, and the spaces are usually filled in to the base of the windows. The greater the difference between the external and internal air in winter the more rapid is the extraction of heat. It is estimated that with a sawdust lining, some 40 per cent. more warmth will escape in cold weather than with a lining of mineral wool. The latter lining for a 40 × 8 ft. passenger car will require aboue 160 cubic feet of filling, at a cost of about $30. This is more than sawdust or shavings cost, but the mineral wool is indestructible. There are two grades of this material. Most car builders have heretofore used the ordinary grade of "slag wool," but a much lighter article is now furnished, called "rock wool," the difference in weight for the floor, sides, and ends of a medium sized car being about 1,000 pounds. Full particulars in respect to grades and prices may be obtained on application to the United States Mineral Wool Co., 22 Cortlandt street, New York.

Indurated Fiber Ware.

Wood pulp has for many years been extensively used in the manufacture of paper, and a machine has at length been prefected by which it can be molded into ware for holding liquids. The requisite strength is given to the fiber by a peculiar treatment discovered by Prof. Carmichael, of Bowdoin College, the result being that the indurated fiber pail is now offered to the trade for trial and test, although it has already been tested in a most thorough manner by a number of large manufacturers who took the pails to their mills and houses for the purpose.

The process of manufacture consists in pumping the liquid pulp into the machine, where it is molded by the necessary appliances into the form of a pail. It is then kiln-dried, saturated and baked at a high temperature, producing a most beautiful finish, as well as strength and hardness unaffected by hot or cold water, acids, alkalies, benzine, turpentine, etc., and at the same time it is absolutely tasteless. The pail is all in one piece, has no hooks, is not painted or varnished, is light, handsome and durable, and well adapted to form a prominent feature in the category of railroad supplies. The name of a railroad or other design can be stenciled and baked into the ware permanently. The ware is manufactured by The Indurated Fiber Co., of Lockport, N. Y., under a strong list of patents, all conflicting or valuable patents relating to the business having been bought in.

Western Railway Club.

175 DEARBORN STREET,
CHICAGO, Nov. 22, 1886.

Next meeting of this club will be held in the Grand Pacific Hotel, Chicago, December 15, at 2 P. M.

The subjects for discussion are:

1. Report of committee consisting of Messrs. Jacob Johann, B. K. Verbryck, and J. Townsend appointed to recommend rules respecting the replacing of broken draw-bars in interchange of cars. Mr. Johann will report.

2. Rules of Interchange of Cars, Nos. 9, 10, and 11. Mr. B. K. Verbryck will open this discussion.

3. What is the best form of packing for piston heads and for stuffing boxes? Mr. H. L. Cooper will introduce this subject.

The members of the club will be pleased to receive in writing the views, on the subjects mentioned, of railroad men who cannot attend the meeting.

You are cordially invited to attend these meetings.

For the Committee, ANGUS SINCLAIR, Sec'y.

The Professor in the Machine Shop is the title of a book published by E. P. Watson & Son, 150 Nassau street, New York, the work being a reprint of articles that have appeared in the *Mechanical Engineer*. The book is composed of a series of sketches of machine shop life and experience, written in an easy colloquial style that is interesting to all readers, and is likely to be particularly well appreciated by the mechanical world. The various men in the machine shop, by their conversations and actions supply the practical facts about methods of doing machine work and the Professor comes in constantly to explain principles. The writer has devised an ingenious method of teaching principles and practice in a style racy enough to attract readers among those who care for nothing in books more than amusement. There are few shopmen or engineers who will fail to find instruction in the Professor's explanations of the why and wherefore of things often accepted as true without investigation, and engineers who spend more time in the office and drawing-room than in the shop, will be benefited by reading Moulton's observations. In the portrait of Moulton on the front page, by the way, we recognize Mr. E. P. Watson, editor of the *Mechanical Engineer*. The book is sold for $1.35.

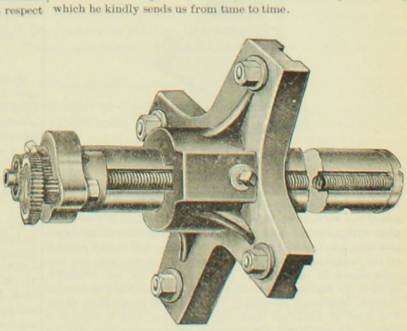
The Office is the name of a monthly journal, the sixth number of which has just been issued. It is intended to be of practical service in the counting-room in respect to the best forms and methods suited to office work, and also as a medium of intercommunication between accountants and bookkeepers. There is an ample field for a journal of this kind, and the contents of the November issue give assurance that the new venture will be a success. Published by The Office Co., 205 Broadway, New York.

MR. LOUIS PARISOE has resigned his position as Master Mechanic of the Nevada Central road, and has accepted the appointment of Superintendent of Motive Power of the Guatemala Central Railroad, with headquarters at Guatemala City, Guatemala, Central America. Mr. Parisoe entered the railroad service in 1857, on the Pittsburgh, Fort Wayne & Chicago road, and was subsequently connected with the locomotive departments of various roads, principally narrow gauge. His ability and long experience as a railroad mechanic eminently fit him for his new position.

WE are indebted to the courtesy of Mr. Robert E. Masters, Superintendent of the foundries attached to the Tredegar Iron Works, Richmond, Va., for a copy of a pamphlet describing the industries of Richmond. The work is well got out, finely illustrated with wood cuts, and shows that the industries of Richmond and Virginia are in a flourishing and growing condition.

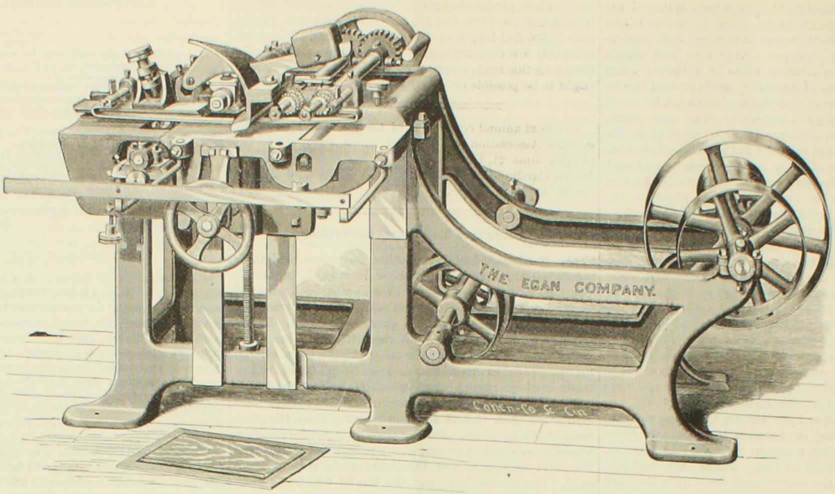
HERBERT M. HOXIE, first vice-president and general manager of the Missouri Pacific system of railways, died in New York, Nov. 23, aged 56 years.

WE are indebted to Mr. James Forrest, Secretary of the Institution of Civil Engineers, London, for the Institute's publications, which he kindly sends us from time to time.



Boring Bar for Lathe.

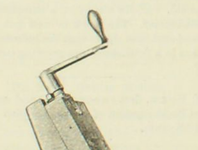
This device is manufactured by Pedrick & Ayer, of Philadelphia. It can be made of any size that may be required. It has hardened centers, and automatic constant feed of cut gears, with steel feed-screw, and is carefully fitted up with a bronze thrust bearing, keeping out all lateral motion. Suitable cutter-heads are furnished with adjustable tool holder. All bars accurately ground to gauge, and are first-class in every particular. Prices vary according to diameter and length of bars,



IMPROVED DOUBLE HEAD PANEL RAISER.

This machine is a complete Double Panel Raiser, with a self-feed, raising panels on both sides in the most complete and perfect style, and making all kinds of blind slats, sticking sash and doo stiles, trunk strips, light moldings, etc. The mandrels are made of the best cast steel, of large diameter, running in self-oiling bearings, lined with the best genuine Babbitt, carrying two angle cutter heads for paneling, to give a shearing cut to the knife, thereby doing the smoothest kind of work on all kinds of wood. The mandrel frames are each provided with a side adjustment screw, a very convenient arrangement which will be appreciated by all practical mill men. There are two feed rolls to the machine, set close to the front pressure bar, and held down by an improved spring regulated by a hand-wheel convenient to the operator, with an adjustment at the back end to give any desired lead to the feed rolls. The bed is raised and lowered by the hand-wheel in front, and is provided with an improved pressure foot and long spring, also an extra fence for long panels. Access to the lower head is obtained by lifting off the end of bed, which part is also adjustable to regulate the depth of cut. The machine will raise panels up to three inches on both sides, and by a change of heads, wider panels and all kinds of sticking can be done to advantage. The tight and loose pulleys are 8×4½, and should make 700 revolutions per minute.

The machine is specially recommended both as double panel raiser and double head sticker. For information as to prices, etc., apply to the manufacturers, The Egan Company, Cincinnati, O.



Cosgrove's Universal Vise Chuck.

This is one of the most complete tools ever produced, because of its great range of positions. It is adapted to swing from a horizontal to a vertical plane, or at any angle therein. A graduated plate with a central stud fills the hole in the base of the vise, enabling it to be set at any angle. It can be held in any position on the trunnion by clamping the body of the vise with the two nuts shown in the cut. A graduated dial on the trunnion, marked by degrees, gives to angle the which the vise can be thrown, facilitating the milling or planing of pieces at an angle. The jaws, of hardened steel, open 8 inches with a depth of 2 inches. In addition to the numerous uses to which this vise can be put on a milling machine, it can be applied also to advantage on a planer, shaper, drill press, etc.

For further information, apply to Pedrick & Ayer, Philadelphia, Pa.

MR. W. F. SMITH, who was long master mechanic at Carlin, Nev., on the Central Pacific Railroad, has been traveling in China, Japan, and other parts of Eastern Asia. He has recently returned to his home in Sacramento, Cal., and is open for an engagement.

Words of Wisdom from P. T. Barnum.

Addressing a body of business men at Bridgeport, the other day, P. T. Barnum said: "You do not, any of you, advertise enough. You ought to use printer's ink every day. You are asleep and want your business to run itself. Standing advertisements in a paper command confidence. The man who for a year lives in one community and leads a reputable life, even though he be of moderate ability, will grow in the confidence and esteem of his fellows. On the same principle a newspaper advertisement becomes familiar in the eyes of the reader. It may seldom be read, still it makes the name and business of the man famili ar and its presence in the columns of a paper inspires confidence in the stability of its enterprise."

The "Brunswick" Car Wheel.

Messrs. Page, Newell & Co., of Boston, have issued the following circular:

BOSTON, NOV. 1, 1886.

The firm of W. R. Ellis & Co. having been this day dissolved by mutual consent, the undersigned beg leave to inform railroad officials that they have succeeded to the business formerly carried on by the above-named firm, in the sale of the Wrought-Iron Spoke Car Wheel manufactured by the Patent Shaft and Axletree Co., of Wednesbury, England, and known as the "Brunswick" wheel.

The record of the Brunswick tire at the present time compares most tavorably with any other make of tire, and upon application we shall be pleased to send mileage records of these tires in support of this statement. The number of wheels sold the past year shows a very large increase over former years, and we feel confident that railroads adopting this wheel will find that for safety and durability they have no superior in the market.

Some of the important features of these wheels are, that they can be re-tired in any railroad shop; that the wrought-iron center is practically indestructible, and will wear out several tires; and furthermore, the cost of re-tiring is several dollars less per wheel than any other pattern of steel-tired wheel in the market.

Full particulars and prices will be sent on application.

We have retained the services of Mr. Geo. H. Coney, formerly with W. R. Ellis & Co., who will represent us as our traveling agent.

PAGE, NEWELL & CO.,
139 Milk St., Boston, Mass.

Mr. W. R. Ellis, who, as noted above, resigned the American agency for the Patent Shaft & Axletree Co., of Wednesbury, England, proposes hereafter to supply steel-tired wheels with centre or tires of either American or foreign make, as may be desired by the purchasers. Mr. Ellis retains his former office at No. 18 Broadway, New York.

E. & F. N. SPON, 35 Murray street, New York, have issued a new catalogue of their books relating to applied science. The subjects that the books treat on are arranged alphabetically, which makes the catalogue very simple. In the list we note seventeen books relating to railway subjects, besides others on the steam engine and other subjects that many railway men are likely to be interested in. We advise railway reading men to send for the catalogues. They are sure to find some books in it that they have been looking for.

MR. W. H. SHUEY, who has for a number of years been General Superintendent of the Worcester Excursion Car Co., has resigned his position to accept the more lucrative one of Secretary and Treasurer of the Railway Age Publishing Co., of Chicago. Mr. Shuey's experience, and unequaled business capacity as exhibited in his former responsible position, eminently fit him for the new duties he has assumed. We take pleasure in congratulating the Age Publishing Co. on securing his services, which were so highly appreciated by his late employers that they accepted his resignation with great reluctance.

THE PROSPECT MACHINE & ENGINE CO., of Cleveland, O., have among their recent orders, one for an engine of 265 h. p. from the Brown Hoisting & Conveying Co., and one of same size for A. G. Cook, Laconia, N. H., and have just shipped a 450 h. p. engine to the Bohn Manufacturing Company, St. Paul, Minn., and will soon ship one of 850 h. p. to A. H. Hart Co., New York, and one of same size to Mahoning Valley Iron Co., Youngstown, O.

THE MAGNOLIA ANTI-FRICTION METAL is claimed to be the best compound for car, locomotive and machinery bearings, its superiority to the best genuine Babbitt metal having been shown by numerous tests recently made and certified to by reliable parties. Manufactured by Chas. B. Miller, 2½ Coenties Slip, New York. New York Depository: E. B. Greeley & Co., Railway Supplies, 7 Dey street, New York.

MR. EDGAR H. ANDRESS, formerly Purchasing Agent of the Lake Erie & Western Railway, has associated himself with Mr. Geo. W. L. Marsden and Mr. F. T. Flinn, under the corporate name of The Marsden Andress Co., in the manufacture of vitreous paints for railroad use. Mr. Marsden has had some thirty years experience in railroad painting. Mr. Flinn is a member of the firm of Jas. Flinn & Sons, of Philadelphia. The office of the new company is at 413 Walnut street, Phila.

Our Directory.

We note the following changes since our last issue. Our readers will do us a great favor by giving us prompt notice of any changes that may come to their knowledge or of any errors that may be noticed in our list:

Boston & Albany.—Edward Gallup has resigned the position of General Superintendent, to accept the appointment as General Manager of the Lake Shore & Michigan Southern road.

Chicago, Rock Island & Pacific.—The authority of T. B. Twombly, General Master Mechanic, and B. K. Verbryck, General Master Car-Builder, is extended over the Chicago, Kansas & Nebraska, this company's new extension west of the Missouri River. J. H. Kirk is appointed Master Mechanic and A. J. Blauvelt Master Car-Builder of the Chicago, Kansas & Nebraska Division, with offices at Low, Kansas.

Cincinnati, Hamilton & Dayton—C. H. Cory, late of the Hoosac Tunnel & Western, has been appointed Superintendent of Motive Power, in place of John Black, resigned.

Hannibal & St. Joseph.—T. J. Potter, Vice-President, will in future act as General Manager, in place of J. F. Bernard, who has gone to the Ohio & Mississippi

Louisville, Evansville & St. Louis.—W. H Folsom has been appointed Purchasing Agect.

Louisville, New Albany & Chicago.—George Stevens has resigned his position as Purchasing Agent of this road.

Minnesota & Northwestern.—Joel May has been appointed Superintendent of the St. Paul Division.

Naugatuck.—Henry D. Beach has been appointed Assistant Superintendent.

Nevada Central.—Louis Parisoe has resigned the position of Superintendent of Motive Power, and has gone to the Guatemala Central road, Guatemala, C. A.

New York, Pennsylvania & Ohio.—J. H. Holway has resigned his position as Purchasing Agent, and has gone to the Colorado Midland.

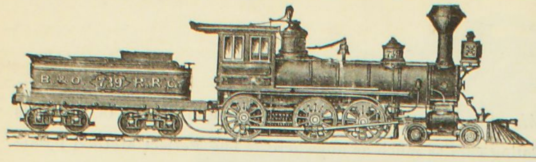
Texas & Pacific.—George Noble has been appointed General Manager. The office of General Superintendent is abolished.

Wabash, St. Louis & Pacific.—A. W. Quackenbush has been appointed Master Mechanic of the Moberly shops, and is succeeded by Caleb Remmel as Master Mechanic of the Detroit Division.

Worcester Excursion Car Co.—On account of the resignation of General Superintendent W. H. Shuey, the office of the company, at 115 Broadway, New York, will be discontinued until further notice. Communications relating to the operating department should hereafter be addressed to the office of the company at Worcester, Mass.

Employment.

WANTED.—By a young married man, a situation as Foreman Car-Builder; has had eleven years' experience in building and repairing passenger coaches and freight cars, and has served for some years as Master Car-Builder for a leading railroad. Can furnish good references. Address "W. N. C.," office of NATIONAL CAR AND LOCOMOTIVE BUILDER.



PITTSBURGH LOCOMOTIVE AND CAR WORKS
PITTSBURGH, PA.
MANUFACTURERS OF
Locomotive Engines for Broad or Narrow Gauge Roads,
From standard designs, or according to specifications, to suit purchasers.
Tanks, Locomotive or Stationary Boilers Furnished at Short Notice
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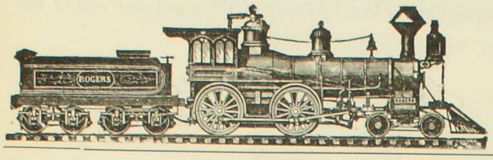

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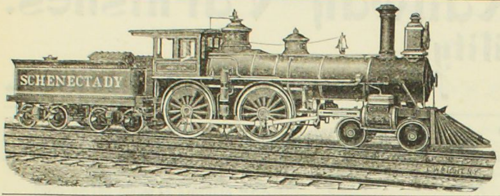

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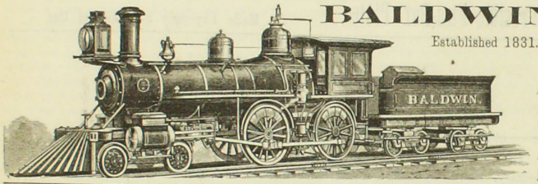

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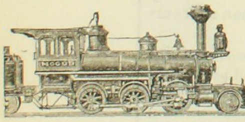

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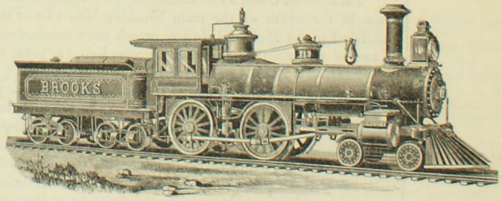

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